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Associate Training Programs in the Medical and Biological Sciences

at the NATIONAL INSTITUTES OF HEALTH

1966 Catalog

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DISCRIMINATION PROHIBITED

Title VI of the Civil Rights Act of 1964 states: "No person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subject to discrimination under any program or activity receiving Federal financial assistance." Therefore, the Associate Training Programs in the Medical and Biological Sciences at the National Institutes of Health, like every program or activity receiving financial assistance from the Department of Health, Education, and Welfare, must be operated in compliance with this law.

1966

SCHEDULE FOR APPOINTMENTS BEGINNING JULY 1, 1968

January 15-May 2

Applicants may request forms. All such requests must be *received* at the National Institutes of Health by May 2.

May 9

Deadline for receipt at NIH of completed applications.

June 13-July 1

Interview period at NIH campus, Bethesda, Maryland (by invitation only).

**July 13 and
succeeding days**

Notification by telephone to successful candidate.

July 14 to 25

Notification by letter to all candidates.

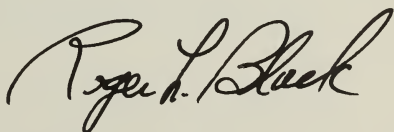
The National Institutes of Health conducts and supports research to find better ways of preventing or curing disease and lengthening life. In pursuit of that mission, NIH provides broad support for biomedical research, research training, and construction of research facilities in the Nation's medical and dental schools, universities, and other research centers. This is the NIH extramural program.

FOREWORD

NIH conducts laboratory and clinical research in its own facilities on its 306-acre campus in Bethesda, Md. For example, in the past year, over 4,000 patients were admitted for investigative studies in the Clinical Center—a research hospital with 516 patient beds and 1,100 laboratories. At any point in time, more than 1,400 research projects are in progress here on the Bethesda campus and at field offices directed from here. This is the NIH intramural program.

Of the 1,800 NIH staff members with doctorates, almost 1,000 have M.D. degrees, 700 have Ph. D. degrees, and some have both. Fifty are dentists, 40 are veterinarians. These individuals with their 3,600 scientifically trained assistants, represent most of the disciplines that contribute to new medical knowledge.

In this scientific community, many opportunities for professional development are available to physicians and others who are undertaking careers in medical or related research, or in academic medicine. The purpose of this catalog is to set forth in one place brief descriptions of programs of concern to those interested in Associateships at the NIH.



ROGER L. BLACK, M.D.,
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PART ONE

General Characteristics of Associateships

UNUSUAL opportunities for training and experience in clinical and laboratory investigation are available to physicians who receive appointments as Clinical, Research, and Staff Associates at the National Institutes of Health. These positions provide broad opportunities for career development in most of the medical specialties and basic science disciplines.

Physicians who are entering internship on or before July 1, 1966, or those with more advanced training may apply. Selections are usually made 2 years in advance, and successful candidates are considered for residency training deferment through the PHS CORD Program until their effective date of appointment.

Although appointments are not limited to those who qualify for the Commissioned Corps of the PHS, most Associates enter NIH as commissioned officers. For young men who have not fulfilled their military obligation under Selective Service, this obligation can be discharged as Commissioned Officers of the PHS while doing work that will contribute to their growth in chosen fields of interest. The residency deferment program, financial rewards, and other benefits gained by the Public Health Service Commissioned Officer are explained in Part Two of this publication.

Appointees are designated as Clinical Associates, Research Associates, and Staff Associates. Each Associate is assigned to a preceptor under whose di-

rection he participates in a research program. This represents the most important part of his training experience.

The preceptors are staff members who give generously of their time to help the Associate—not only in relation to research problems under investigation, but in any way they can to enrich the experience of the Associate during his stay at NIH. The levels of research responsibility and latitude given to an Associate depend upon his training and experience as well as his interests and initiative.

Separate didactic exercises are designed to complement Clinical and Research Associateships, but Associates in all three categories are welcome to attend any of the exercises which can accommodate them if their schedules permit. In addition, postgraduate instruction is available through evening courses offered by the Foundation for Advanced Education in the Sciences, Inc. (see Part Four), and Associates in many program areas are expected to take advantage of this academic opportunity.

Associateship appointments are generally made for 2 years; in certain Institutes, appointments may be extended for an additional year. Unless he seeks transfer to another area of the Public Health Service, an Associate may expect to end his active duty as an officer at the completion of his Associateship appointment.

The Clinical Associate

The Clinical Associate participates in both clinical and laboratory research. Institute programs differ in the proportion of time devoted to laboratory and clinical responsibilities. However, it is a fair estimate that one-half to two-thirds of the Associate's time will be devoted to laboratory research, the remainder being devoted to clinical care of research patients.

Ward activities are under immediate supervision of competent clinical investigators, and include a wide variety of rounds, conferences, and other instructive exercises. Proximity to the patient's bedside of collaborating scientists from many biological disciplines has created an unusual opportunity for clinical investigation at the NIH Clinical Center.

The great majority of Clinical Associates are not in formal residency training programs, even though they may be performing many of the same functions that residents do in other hospitals. Some Associates appointed to Dermatology, Neurology, and Psychiatry programs are recommended for a limited amount of residency credit by their respective program chiefs;

and Associates in Internal Medicine who remain at NIH for a third year may receive credit for this year upon application to the American Board of Internal Medicine.

The Research Associate

The Research Associate devotes the larger portion of his time to laboratory research in the biomedical sciences; and no clinical responsibilities are involved.

His preceptor is responsible for training him in research methodology and design, and for guiding him in the conduct of specific research undertakings and in the interpretation of results. A real effort is made to select research problems which will enable the Associate to gain breadth and perspective, encounter a variety of laboratory problems, and learn many different approaches rather than become a specialist in one or two refined techniques.

In addition, the Research Associate participates in a series of formal tutorial seminars and informal discussion groups designed in content and emphasis for prospective independent investigators. As described later (see Part Four, Seminars), these discussions are arranged in five divisions, each of which deals with one of the major subdivisions of research in the life sciences.

The Staff Associate

The Staff Associate position was established at NIH in 1964. It provides opportunities for those highly qualified candidates who could contribute significantly to research in areas which are not specifically designated in the Research or Clinical Associate categories. The Staff Associate may participate in either laboratory or clinical research or both, depending upon the activities of the senior investigator with whom he works. Research experience may be supplemented by formal evening study courses, as well as by attendance at lectures by guest speakers and a variety of regularly scheduled seminars.

PART TWO

Applying for an Associateship

APPROXIMATELY 100 Clinical Associates and 50 Research and Staff Associates are appointed annually, usually as commissioned officers. In special cases, appointment may be considered under the Civil Service mechanism. Of course, in such instances, the following statements relating to the PHS Commissioned Corps, the commissioning process and the CORD Program would not apply.

To be considered for a Clinical, Research, or Staff Associate appointment, an applicant must submit the following forms properly executed no later than May 9, 1966 to the Chief, Clinical and Professional Education, National Institutes of Health, Bethesda, Md., 20014:

- Information Record for Clinical, Research, and Staff Associate positions;
- Program Area Selection Check List;
- Application for Appointment as a Commissioned Officer in the U.S. Public Health Service (2 copies) ;
- Fingerprint chart (fingerprints may be obtained at PHS facilities or through the local police or post office) .

The applicant is responsible for requesting the following materials, which must be received by May 9 to complete the application:

- Three sets of references from professional persons whom the candidate has listed on the NIH information sheet (each set consists of: 1. Request for evaluation; and 2. Statement regarding applicant for a commission in the U.S. Public Health Service).
- Two copies of all college and medical school transcripts (showing class standing, if available).

A candidate's application for a commission in the Public Health Service does not commit him to accept a commission in the event he is not selected for an Associate position at NIH. However, there are many splendid alternative opportunities for physicians in the Public Health Service which may appeal to such a candidate, and this commission application would be usable for such appointments.

Eligibility Requirements

To qualify for a commission, an applicant must:

- Be a citizen of the United States;
- Meet the physical standards of the Public Health Service (a physical examination is given at a PHS facility); and
- Pass an objective multiple-choice examination administered by the PHS and covering the general field of medicine.

In addition, to be considered for CORD Program participation, an applicant must:

- Be a graduate of a medical school approved by the Council on Medical Education of the American Medical Association.
- Be currently interning or have completed an internship approved by the Council on Medical Education of the American Medical Association.
- Be liable for 2 years of service under the general provisions of the Universal Military Training and Service Act.

NOTE: Even though tentatively selected for an Associateship at NIH, an applicant cannot participate in the CORD Program unless also found fully qualified for appointment as a commissioned officer and will pursue *clinical* training which is fully creditable toward fulfillment of minimum residency requirements for certification by an American medical specialty board.

Commissioned Officer Residency Deferment Program

The Commissioned Officer Residency Deferment Program (CORD), developed and conducted by the U.S. Public Health Service with the cooperation of the Selective Service System, permits a limited number of draft-eligible physicians (1) to become Inactive Reserve officers in the Commissioned Corps of the Public Health Service and (2) to complete 1 or more years of formal residency training before serving on active duty.

In this program, selected physicians who are obligated for 2 years of military service under the general provisions of the Universal Military Training and Service Act are deferred by the Director of the Selective Service System for residency training in specialties that are pertinent to the projected requirements of the Public Health Service.

CORD Program participants are appointed commissioned officers in the Inactive Reserve of the Public Health Service. They do not receive pay from the Service until called to active duty. The stipend normally paid by the hospital to residents may be accepted by CORD Program officers.

When residency training is completed and/or deferment is terminated, the CORD Program officer is obligated to serve on active duty with the Public Health Service for a period of at least 24 months. This period of service will satisfy Selective Service obligations and no further service is required.

It should be noted that, even though tentatively selected for the CORD Program, an applicant cannot participate unless also found fully qualified for appointment as a commissioned officer.

The questions most frequently asked by CORD Program applicants and participants are answered below:

Q. May I apply simultaneously for the Berry and CORD Programs?

A. Yes.

Q. As an intern in a USPHS hospital (or other uniformed service hospital), am I eligible for the CORD Program?

A. If you are interning as a commissioned officer on active duty in the Army, Navy, Air Force, or Public Health Service, you are not eligible to participate in the CORD Program.

Q. Are participants in the Senior Medical Student Program of the Army (or other service) eligible for the CORD Program?

A. No.

Q. As a CORD participant, may I be deferred for a research fellowship?

- A. No. Deferment may not be recommended for periods of basic science or other graduate training unless the academic training is an integral part of a clinical residency program. Such training must be fully creditable toward fulfillment of minimum residency training requirements for certification by an American medical specialty board.
- Q. I wish to continue my residency training and have applied for the CORD Program. Will the induction notice I recently received from my local Selective Service board alter my status as a CORD Program applicant?
- A. Yes. You are no longer eligible for CORD Program consideration, unless the induction notice is canceled. "Postponement of induction" will not reestablish your eligibility.
- Q. Is there an age limit for the CORD Program?
- A. Yes. You must complete CORD Program participation and begin active duty before age 32.
- Q. If I am not successful in seeking an NIH Associateship, may I still participate in the CORD Program?
- A. Yes. If you apply and are not accepted for an NIH Associate assignment, you may elect (1) to withdraw your application for the CORD Program, or (2) to be considered for residency deferment under the CORD Program and subsequent active duty in one of the other activities of the Public Health Service.
- Q. I have received notification of selection for CORD Program participation and deferment beginning July 1, 1967. Is it possible for my deferment to begin on February 1?
- A. No. Deferment before July 1 cannot be arranged.
- Q. I was selected for the CORD Program and residency training in surgery but have now decided I wish to train in pediatrics. May I change my specialty?
- A. No. Changes in specialty are not permitted after selections are made.
- Q. May I change hospitals while participating in the CORD Program?
- A. Yes, provided the new program is approved by the Council on Medical Education of the American Medical Association, all the training is fully creditable by your specialty board, and you notify the Public Health Service Office of Personnel.
- Q. Is it possible to withdraw from the program prior to actual deferment?
- A. Yes. You may withdraw your CORD Program application at any time prior to appointment as a commissioned officer, or, if you have already been appointed, you may resign the commission. The Selective Service will be notified of your withdrawal or resignation.
- Q. Is it possible to withdraw from the program while pursuing residency training as a CORD Program officer?
- A. Yes. You may request active duty in the Public Health Service.
- Q. For what rank am I eligible?

- A. If you enter the CORD Program immediately following internship, you will be appointed in the grade of assistant surgeon (Inactive Reserve), which is equivalent to lieutenant (j.g.) in the Navy. When called to active duty, you receive a promotion to the grade of senior assistant surgeon (Reserve), which is equivalent to lieutenant in the Navy. A pamphlet giving more details about the CORD Program is available on request.

Method of Selection—Matching Program

Appointments are based upon intellectual attainment and demonstrated research interest and ability. A man's background in research is often a decisive factor in making selections. This applies more significantly in certain areas—such as internal medicine and psychiatry—than in others—such as surgery and radiation therapy.

All applications are carefully considered; but it should be understood that successful candidates have outstanding records in medical school and their references indicate that they have exceptional research training and/or potential.

Associates are selected by a system of matching the candidates' program-area preferences against nominations made by the Institutes (similar to NIMP, Inc.).

In his packet of forms, a candidate will find several sheets, each headed "Program Area Selection Check List." After reading Part Three of this catalog, he should check off on these sheets the areas in which he is interested. He does not indicate his preferences at this point, and he is not limited to any particular number of choices. The check marks that he makes will determine the offices and laboratories to which his application will be circulated at the National Institutes of Health.

After thorough review of all candidates' qualifications by the Institutes, a limited number of candidates will be selected for personal interviews to be held during a 3-week period from June 13 through July 1. Candidates should be prepared to come to NIH for an interview on short notice on any date within this period, at their own expense. All interviews are by invitation and will be arranged through the Chief, Clinical and Professional Education. Following interviews, candidates will be requested to indicate their preferences, which are kept in confidence and used exclusively for matching against the Institutes' nominations. Successful candidates will be notified by telephone on July 13 and succeeding days and be given an opportunity to accept or reject the positions for which they were matched.

PART THREE

Program Areas for Which Candidates May Apply

EACH of the major NIH components has prepared a description of its program areas for which Associates may seek appointment. Due to diversity of the operations and programs within these major components, the descriptions do not follow a pattern. In effect, however, all of these descriptions are meant to anticipate the questions which applicants may have in selecting the program areas for which they wish to be considered. It should be noted that a candidate is not limited as to the number or kinds of positions for which he may apply.

National Cancer Institute

Director, Kenneth M. Endicott, M.D.
Clinical Director, Nathaniel I. Berlin, M.D., Ph. D.

GENERAL. The National Cancer Institute conducts research and provides training in its own laboratories and branches, directs research carried out under contract with other laboratories, and provides grant support of research and training in non-Federal institutions.

Throughout the Institute opportunities exist for clinical and professional

education. Research projects directed toward recognition of the causes of cancer, understanding of the processes of the disease itself, and development of methods for controlling or preventing the disease engage the attention of scientists representing many disciplines.

Laboratories and Branches

- Director of Intramural Research, Eugene J. Van Scott, M.D.
- Chief, Laboratory of Biochemistry, Herbert A. Sober, Ph. D.
- Chief, Laboratory of Biology, Walter E. Heston, Ph. D.
- Chief, Laboratory of Physiology, Julius White, Ph. D.
- Chief, Laboratory of Pathology and Pathologic Anatomy Branch, Harold L. Stewart, M.D.
- Chief, Dermatology Branch, Eugene J. Van Scott, M.D.
- Chief, Endocrinology Branch, Mortimer B. Lipsett, M.D.
- Chief, Immunology Branch, John L. Fahey, M.D.
- Chief, Surgery Branch, Alfred S. Ketcham, M.D.
- Head, Metabolism Service, Nathaniel I. Berlin, M.D., Ph. D.
- Associate Director for Field Studies, Paul Kotin, M.D.
- Chief, Laboratory of Viral Oncology, W. Ray Bryan, Ph. D.
- Chief, Laboratory of Viral Carcinogenesis, Albert J. Dalton, Ph. D.
- Chief, Virology Research Resources Branch, Robert E. Stevenson, Ph. D.
- Chief, Carcinogenesis Studies Branch, Hans L. Falk, Ph. D.
- Chief, Epidemiology Branch, Robert W. Miller, M.D.
- Chief, Biometry Branch, William M. Haenszel, M.A.
- Associate Director for Collaborative Research, C. Gordon Zubrod, M.D.
- Chief, Cancer Chemotherapy National Service Center, Saul A. Schemper, Ph. D.
- Chief, Drug Evaluation Branch, Abraham Goldin, Ph. D.
- Acting Chief, Drug Development Branch, Harry B. Wood, Jr., Ph. D.
- Chief, Endocrine Evaluation Branch, Erwin P. Vollmer, Ph. D.
- Chief, Medicine Branch, Seymour Perry, M.D.
- Chief, Laboratory of Chemical Pharmacology, David P. Rall, M.D.
- Acting Chief, Radiation Branch, Ralph E. Johnson, M.D.

Intramural Research Area

Basic studies are carried out in LABORATORIES OF BIOCHEMISTRY, BIOLOGY, PHYSIOLOGY, and PATHOLOGY and in the PATHOLOGIC ANATOMY BRANCH under the general direction of Dr. Eugene Van Scott.

In the LABORATORY OF BIOCHEMISTRY, research is directed toward the recognition, elucidation, and control of the neoplastic transformation. To this end, the disciplines of chemistry, biochemistry, biology, and physical

chemistry are used to study the composition, metabolism, structure and function of isolated biological components. Special attention is given the macromolecular components of the cell and their organization in intracellular organelles, whole cells, tissues and organs, with reference to their role in differentiation and control processes.

In the LABORATORY OF BIOLOGY, carcinogenesis is studied in the broad biological sense including the genetic, hormonal, immunological, and viral factors as well as chemical and physical carcinogens and the manner in which these factors lead to the malignant transformation of the cell. Studies are aimed at revealing the nature of this transformation as it occurs under well-controlled conditions in tissue culture. The ultrastructure of these cells and tumors is studied. The role of the thymus in immunology and in viral and chemical carcinogenesis is at present receiving considerable emphasis, as are studies of genetic control of synthesis of abnormal proteins produced by plasma cell tumors and of other blood and urinary proteins.

In the LABORATORY OF PHYSIOLOGY, physiological and biochemical properties of the growing tumor and its impact on the host are studied, as well as the following: purine and pyrimidine ribo- and deoxyribo-nucleotide synthesis in bacterial and mammalian tissue with particular emphasis on control mechanisms; the kinetics of cell proliferation as affected by high energy radiation and its effect on cell and animal physiology; by the use of physiochemical techniques, nature of nucleic acid and nucleoproteins of normal and malignant tissues as well as viruses; control mechanism in protein synthesis by normal and tumor cells and the mechanism of action of antimetabolites on these processes; and mechanisms of the synthesis and secretion of thyroid hormones and thyroid tumors.

In the LABORATORY OF PATHOLOGY and the PATHOLOGIC ANATOMY BRANCH, normal and malignant tissues are examined and compared. The spontaneous development of cancer in untreated laboratory animals is observed to arrive at a better understanding of the basic biologic nature of the disease. Residency training in pathologic anatomy is available in the Pathologic Anatomy Branch and, in conjunction with the Clinical Pathology Department of the Clinical Center, a complete residency in pathology is available (see addendum to this catalog).

Cancer research in the clinical branches is primarily oriented toward the disease process in man and frequently is in the form of clinical investigation. This research is performed by scientists in the DERMATOLOGY, ENDOCRINOLOGY, IMMUNOLOGY, and SURGERY BRANCHES, and the METABOLISM SERVICE.

In the DERMATOLOGY BRANCH, studies are designed to identify and characterize the biologic behavior patterns of epithelial and lymphoid tissues in normal and pathologic circumstances. These studies seek to determine factors that can alter or establish a specific pattern of response of the cell.

In the **ENDOCRINOLOGY BRANCH**, the role of the endocrine system in the causation, development, and treatment of cancer is under intensive study in patients with tumors arising in either hormone-producing or hormone-sensitive organs. Related research in steroid and protein hormone metabolism is carried out in the laboratory.

In the **IMMUNOLOGY BRANCH**, physiochemical, immunochemical, tissue culture, and *in vivo* turnover techniques are used in research on the structure, biosynthesis, and genetic control of the immunoglobulins. Cell recognition systems, cellular antigenicity, and anticell antibodies are studied in connection with homotransplantation and tumor investigations in man and animals. Immunochemical and cytologic techniques are used in studies of complement and mechanisms of cell damage.

Of major interest to Institute surgeons is control, through surgery, of pelvic malignancies, tumors of the head and neck area, skin, bone, and soft tissue tumors, and tumors of the urogenital system. In the **SURGERY BRANCH**, studies of patients with such malignancies are concentrated in four major areas: primary surgical therapy, various aspects of the host response to cancer, factors associated with the dissemination of cancer, and urological manifestations of a number of disease entities.

The **METABOLISM SERVICE** is studying the metabolism of tumors and the effects of tumors upon the metabolism of their hosts. To achieve these objectives, the research program includes studies of the anemia of cancer, porphyrin and bile pigment metabolism, nucleic acid metabolism, calcium metabolism, and the rate of protein synthesis in patients.

Field Studies Area

In the Field Studies area, a major responsibility of scientists under the direction of Dr. Paul Kotin is planning and implementing programmed research to improve understanding of cancer causation and the patterns of cancer occurrence.

A program of virus-cancer studies is carried out in the **LABORATORIES OF VIRAL ONCOLOGY and VIRAL CARCINOGENESIS**. Research activities range from the subcellular level to that of the intact host, including man. A special program is expanding basic and applied research on the possible viral etiology of leukemia. Institute scientists are collaborating with non-Federal investigators in multidisciplinary studies on animal tumor viruses and in the search for viruses in human cancer.

A special program to provide resource needs of cancer virologists, such as standardized cell lines and new varieties of research animals, is located in the **VIROLOGY RESEARCH RESOURCES BRANCH**.

Chemical hazards in man's environment are of special concern to investigators in the **CARCINOGENESIS STUDIES BRANCH** of the Field Studies

area. Emphasis here is placed on the interaction of host factors with multiple environmental factors.

The EPIDEMIOLOGY BRANCH plans and conducts studies using data from existing sources such as vital and employment records and clinical observations. These investigations seek clues to cancer causation through analysis of interrelationships in the human and domestic animal populations with respect to their total environment and inheritance.

Some of the biostatistical studies carried out by the BIOMETRY BRANCH are also concerned with the causes of cancer. Others are devoted to evaluating methods for diagnosing and treating cancer. In this connection, more than 100 hospitals in the United States are cooperating in a patient registration and followup program.

Collaborative Research Area

A coordinated program of direct and contracted research emphasizing chemotherapy is under the direction of Dr. C. Gordon Zubrod.

Preclinical drug development is conducted by investigators in the DRUG EVALUATION, DRUG DEVELOPMENT, and ENDOCRINE EVALUATION BRANCHES. The pharmacology, toxicology, and metabolism of drugs are studied by scientists in the LABORATORY OF CHEMICAL PHARMACOLOGY. In the MEDICINE BRANCH, physicians evaluate new agents for control of leukemias, lymphomas and solid tumors. They carry out research on granulocyte and platelet transfusions, the biochemistry and physiology of normal and malignant white blood cells, cytogenetics, and the effects of neoplastic disease and antitumor agents on immunity.

New techniques in radiotherapy and combined approaches with chemotherapy and surgery are being developed by the RADIATION BRANCH. Studies are focusing on Hodgkin's disease and malignant tumors of bone and urinary bladder.

National Heart Institute

Robert W. Berliner, M.D., Director of Intramural Research

Donald S. Fredrickson, M.D., Clinical Director

A. Associate Program in Medicine and Basic Science

The National Heart Institute currently appoints 11 Associates for a 2-year period beginning each July 1. Three of these positions are as Research Associates, six as Clinical Associates, and two as Staff Associates.

For those who are interested in lengthening their period of research experience, the appointment may, by mutual agreement, usually be extended for a third year.

Candidates may apply for one or more types of Associate positions. In selection of Associates preference is given to candidates who intend to devote a significant portion of their career to research. Because of the diversity of the Heart Institute program, special interest in cardiovascular disease is not an essential requirement.

Research and Clinical Associates

The Associate is free to choose his own area of research assignment. After his appointment in the Heart Institute and prior to his entering on duty, he will make a separate visit to select the laboratory in which he will work. The choice is based on the background and interests of the Associate and is contingent only on the ability of the particular laboratory to furnish proper supervision and facilities. (On the basis of past experience, it would appear virtually certain that each Associate will be able to work with the group of his choice.) The level of research responsibility and freedom will depend upon his training and experience as well as his desires.

RESEARCH ASSOCIATES. These appointments are designed to give physicians an opportunity to improve their background for a career in basic medical research. Usually physicians enter the appointment after completing internship and one year residency, but there are no specific requirements for postgraduate training after the M.D. degree.

Each Research Associate will devote his time to research in the laboratory under the immediate supervision of a preceptor in an area of his selection. Each will select appropriate courses in the basic, medical and allied sciences, and seminar and journal club exercises common to the program arranged for Research Associates of all the Institutes. No clinical assignments are involved, but the Associates are welcome to attend any of the clinical teaching exercises.

CLINICAL ASSOCIATES. These appointments are designed to give physicians training in both clinical and basic research. Candidates must have completed a minimum of 1 year of internship plus 1 year of residency in internal medicine by the starting date of their appointment.

Clinical Associates will be responsible, under the guidance of investigators on the Heart Institute staff, for the medical care of patients during 10 of the first 14 months of their service. During this time they will rotate through the four medical services of the Heart Institute, which occupy 85 beds. These services include: (1) Cardiology—clinical studies of physiology and pharmacology of the heart; development and application of diagnostic techniques for evaluation of cardiac lesions; selection and pre-

operative evaluation of candidates for cardiac surgery; (2) Clinical Endocrinology—metabolic and endocrine problems, including regulation of aldosterone secretion, relationship of steroid structure to activity, calcium and phosphorus metabolism, and application of metabolic balance techniques; (3) Experimental Therapeutics—origin and treatment of hypertension, cardiac arrhythmias, secreting tumors (carcinoid, pheochromocytoma), collagen metabolism, and the biological activities of vasoactive amines; (4) Metabolism, Kidney, and Electrolytes—disorders of lipid metabolism or due to molecular abnormalities of proteins; studies of renal function and action of diuretics.

The clinical period is one of intensive training under direction of the Clinical Director and staff. It offers exposure to case material of an extraordinary range and to highly sophisticated approaches to investigation of disease.

The Clinical Associate devotes both his time off the wards and a full 14 months of his 2-year assignment to laboratory research under direction of a preceptor *in any one of the Heart Institute laboratories, either clinical or nonclinical*. No clinical responsibilities are required during the optional third year. The Associate may also participate in some of the seminars and instruction available to the Research Associate.

Laboratories and Sections

The laboratories and sections of the National Heart Institute, all of which are open to Clinical and Research Associates for their research work, are listed below with the names of their chiefs. Candidates desiring further information may obtain a current bibliography summarizing the activities of the current staff by writing to Dr. Robert W. Berliner, Director of Intramural Research, National Heart Institute, Bethesda, Md., 20014.

Laboratory of Biochemistry—Chief, Dr. Earl R. Stadtman

Section on Cellular Physiology—Head, Dr. Wayne Kielley

Section on Enzymes—Head, Dr. Earl R. Stadtman

Laboratory of Chemical Pharmacology—Chief, Dr. Bernard B. Brodie

Section of Biochemistry of Drug Action—Head, Dr. Lewis Schanker

Section on Enzyme Drug Interaction—Head, Dr. James R. Gillette

Section on Organic Chemistry—Head, Dr. Elwood O. Titus

Section on Physiology—Head, Dr. Harriet M. Maling

Laboratory of Clinical Biochemistry—Chief, Dr. Sidney Udenfriend

Section on Biochemical Genetics—Head, Dr. Marshall Nirenberg

Section on Enzymes and Metabolism—Head, Dr. H. H. Weissbach

Section on Physiological Chemistry—Head, Dr. Sidney Udenfriend

Laboratory of Kidney and Electrolyte Metabolism—Chief, Dr. Jack Orloff

Section on Renal Mechanisms—Head, Dr. Robert W. Berliner

Laboratory of Metabolism—Chief, Dr. Daniel Steinberg

Section on Chemistry—Head, Dr. Henry Fales

Section on Lipid Metabolism—Head, Dr. Daniel Steinberg

Section on Molecular Disease—Head, Dr. Donald Fredrickson

Laboratory of Technical Development—Chief, Dr. Robert Bowman

Cardiology Branch—Chief, Dr. Eugene Braunwald

Section on Cardiovascular Diagnosis—Head, Dr. John Ross

Section on Clinical Biophysics—Head, Dr. Donald Fry

Section on Clinical Physiology—Head, Dr. Eugene Braunwald

Clinical Endocrinology Branch—Chief, Dr. Frederic Bartter

Experimental Therapeutics Branch—Chief, Dr. Albert Sjoerdsma

Surgery Branch—Chief, Dr. Andrew G. Morrow

Staff Associates

Two positions will be open in the Laboratory of Chemical Pharmacology and one will be open in the Experimental Therapeutics Branch for Staff Associates in July 1968. The research for which the positions are available is as follows:

LABORATORY OF CHEMICAL PHARMACOLOGY—Research will be under the direction of Dr. Bernard B. Brodie and will be directed toward a study of the synthesis, storage and release of nonmast cell histamine in exocrine secretions and in the control of small blood vessels; the synthesis, storage and release of serotonin and its role in brain and gastrointestinal function; and studies of drugs including drug metabolism, enzyme induction, and mechanisms of drug action.

EXPERIMENTAL THERAPEUTICS BRANCH—Research will be under the direction of Dr. Albert Sjoerdsma and is conducted in two major areas, clinical pharmacology and protein chemistry. The pharmacologic investigations constitute a continuum from, (1) the clinical testing of new drugs in man and the study of patients with hypertension and with secreting tumors, e.g. pheochromocytoma, malignant carcinoid, to (2) classical animal pharmacology, and including (3) basic biochemical pharmacology. Emphasis is placed on catecholamines and drugs affecting their metabolism, serotonin and

related compounds, and vasoactive peptides. In such a setting it is possible to work on a compound from its initial biochemical studies to its final utilization in man as a therapeutic agent.

The area of protein chemistry includes studies of amino acids, peptides, electron transfer proteins, and the collagen macromolecule. The metabolism of collagen is studied in both man and experimental animals in an attempt to find drugs useful in the treatment of collagen disorders.

Formal Instruction

The major form of didactic postgraduate instruction is through the evening courses offered by the Graduate Program of the Foundation for Advanced Education in the Sciences, Inc. Research, Clinical, and Staff Associates are expected to take advantage of this academic work.

B. Associate Program in Surgery

The Surgery Branch of the National Heart Institute appoints approximately five Associates in Surgery for a 2-year period beginning each July 1. The program is primarily designed for young surgeons with primary interests in cardiovascular surgery and cardiovascular physiology. In making appointments, preference will be given to candidates contemplating a career in a research or academic atmosphere. Candidates must have completed an internship and at least 1 year of surgical residence by the starting date of their appointment.

Approximately 1 year is devoted to an intensive clinical experience involving the management of patients undergoing operations for congenital and acquired heart disease. During this period the majority of Associates are also trained in the techniques of cardiac catheterization and angiography and in the interpretation of clinical physiologic data. A period of approximately 1 year is also devoted to research in the experimental surgery laboratory and in clinical investigations related to operative procedures. This work, carried out in association with staff members, will be in the general field of cardiovascular physiology as applied to the treatment of surgical patients.

National Institute of Allergy and Infectious Diseases

John R. Seal, M.D., Director of Intramural Research
Vernon Knight, M.D., Clinical Director

Following are brief descriptions of the principal research programs of each of the NIAID units to which Associate appointments will be made.

THE LABORATORY OF CLINICAL INVESTIGATIONS (Vernon Knight, M.D., Chief) conducts studies of viral infections, systemic fungal diseases, nephrosis, systemic lupus erythematosus, familial Mediterranean fever, malaria, leprosy and miscellaneous immunological disorders. In addition, studies are conducted on mechanisms of fever, allotopy in mice, and immunological response to allergens, penicillin and infectious diseases.

The clinical facilities of the Institute are an important feature of the Clinical Associate program. The clinical care program of NIAID consists of 60 hospital beds, 24 of which are usually assigned to Federal prisoner volunteers in the viral respiratory diseases program. The remaining beds are assigned to the various sections and units. First-year Clinical Associates (except for pediatricians, Clinical Associates are appointed for 3 years) are assigned principal responsibility for ward medical care, usually requiring about 9 months of their first year. The clinical service has the responsibility to provide consultation on infectious disease problems to the other Institutes.

THE LABORATORY OF INFECTIOUS DISEASES (Robert J. Huebner, M.D., Chief) encompasses a broad program on the basic biology, ecology, and clinical significance of viral, fungal, and bacterial agents.

Current studies of respiratory agents are concerned with evaluation of the importance of various pleuropneumonia-like organisms in human disease, with means of producing vaccines against many of the more important respiratory viruses, and with studies of rhinoviruses.

In recent years the program of this section has broadened to include studies of tumor viruses, particularly the development of approaches to studies of viral etiology of human cancer.

Physiological, biochemical, and immunologic aspects of pathogenic fungi and mycotic diseases are investigated.

Studies in basic bacteriology include: the role of iron in nonspecific immunity and in metabolism; the electron transport system of hydrogen-utilizing autotrophs; the biochemistry of cell walls; composition and syn-

thesis of naturally occurring and synthetic antimicrobial agents, bacterial ultrastructure; and basic studies of streptococci.

THE LABORATORY OF BIOLOGY OF VIRUSES (Karl Habel, M.D., Chief) is interested in animal and human viruses not only as the cause of disease but as identifiable macromolecules replicating in close association with cellular processes. The sequential biochemical reactions of cellular and viral elements during the replication cycle of RNA and DNA viruses are studied. Similar work is also being carried out on tumor viruses in attempts to demonstrate their relationships to cellular elements and functions.

A parallel study to those on viral synthesis seeks the physical and chemical makeup of the purified virus itself, utilizing electron microscopy, ultracentrifugation, and nucleic acid and protein analysis.

Other programs investigate mechanisms of recovery from acute virus infection with a major interest in interferon, and the immunological reactions of animals to new antigens produced in cells transformed by tumor viruses.

THE LABORATORY OF IMMUNOLOGY (Maurice Landy, Ph. D., Chief) is engaged in a broad program of research in immunobiology, immunogenetics, and immunochemistry.

The origin of antibodies to bacterial endotoxin and of "natural antibodies" are being explored. Immunological mechanisms involved in anaphylaxis and other types of immediate allergy, in delayed hypersensitivity and in protection, are investigated, at the cellular and subcellular level. The relation between structure and activity of inhalant antigens is studied. Heritable, antigenically different forms of serum proteins known as allotypes have been identified and are used as genetic markers. Proteins which cross maternal-fetal barriers, and the properties of rabbit antibodies directed against simple haptens are also of special interest.

THE LABORATORY OF GERMFREE ANIMAL RESEARCH (John E. Tobie, Ph. D., Chief) provides an unusual facility for many studies. Germfree guinea pigs, rats, chicken, and even inbred strains of mice can be used. Typical projects include fluorescent antibody studies on malaria, host-parasite relations in amebiasis, susceptibility of germfree rats to bacterial infections, "natural" antibodies in germfree animals, pathogenesis of allergic thyroiditis and encephalomyelitis, autoimmune disease in mice, the role of the thymus in antibody-production, γ -globulin metabolism and serum γ -globulin levels in germfree animals.

THE LABORATORY OF BACTERIAL DISEASES (Norman B. McCullough, Ph. D., M.D., Chief) conducts studies on brucellosis as a model of intracellular parasitism and chronicity, on antibody synthesis by mammalian cells *in vitro*, and on PPLO (including bacterial L forms). The latter encompass nutritional requirements, comparative physiology, and antigenic relationships,

characterization of chemical fractions and toxins and their use as immunizing and test antigens.

THE LABORATORY OF PARASITE CHEMOTHERAPY (G. Robert Coatney, Ph. D., Sc. D., Chief) is concerned with chemotherapy of malaria and schistosomiasis.

The staff at Bethesda studies promising compounds for activity against these infections in chickens and mice. Efforts are under way to determine the mechanisms of action of drugs and of resistance to the known anti-malarial compounds, and to exploit FA techniques in measuring immune response.

Sections located at Chamblee and Atlanta, Ga., carry on studies on the exo-erythrocytic cycle of malaria in the monkey and the effect of drugs on these stages, on passive or active immunization of simian hosts, and on monkey malarias as potential zoonoses in man.

THE LABORATORY OF PARASITIC DISEASES (Paul P. Weinstein, Sc. D., Acting Chief) combines fundamental and applied studies on: The immunology, biology, and fine structure of protozoa and helminths; hemagglutination, fluorescent antibody and other tests for toxoplasmosis, amebiasis, schistosomiasis, trypanosomiasis, and *Angiostrongylus* infections; the chemical composition and metabolism of parasites and the effect of parasitism on the host; energy transfer in vertebrate and invertebrate cells; nutritional, physiologic, and biochemical factors involved in parasite growth *in vivo* and *in vitro*; relation of host nutrition to pathogenesis in parasitic infections and to the effectiveness of chemotherapeutic agents. Also included are: A broad program on the schistosomes of man, including snail biology, transmission dynamics, and control; and laboratory investigations on *Angiostrongylus* and filariids concerning infection of the vectors, migrations in the final host, invasion of abnormal hosts, and immunity.

THE LABORATORY OF TROPICAL VIROLOGY (Ned H. Wiebenga, M.D., Acting Chief) studies the etiology and epidemiology of arboviruses and viral diseases in the Americas. Research interests include development and inventory of viral reagents and vaccines, serological classifications of viruses and strains, pathogenesis of viral infections, and virus-vector relationships. Major activity has recently been devoted to studies of hemorrhagic fever in Bolivia. In collaboration with the Middle American Research Unit, the etiologic agent has been identified and related to a similar but different virus in Argentina.

THE MIDDLE AMERICA RESEARCH UNIT (Karl M. Johnson, M.D., Director) is located in the Panama Canal Zone and is a joint effort of the PHS and the U.S. Army. The Unit is primarily concerned with the etiology and epidemiology of viral diseases in countries of Middle and South America,

with emphasis on arboviruses, and with ecology and etiology of selected fungus infections important in the American tropics.

THE ROCKY MOUNTAIN LABORATORY (Herbert G. Stoenner, D.V.M., Director) is located at Hamilton, Mont., and enjoys status as a world center for the study and control of diseases in nature transmitted to man. Its principal interests are the biology of animal and arthropod-borne microbiota including the relationship of agents to arthropods, comparative pathology, the relation of viruses and rickettsia to the evolution of chronic disease, the natural history of indigenous agents transmissible to man, and new methods of arthropod taxonomy. The Laboratory also studies the immunological, chemical, and physical properties of microbial antigens and structure and composition of microorganisms and the relation of cellular constituents to biologic functions.

National Institute of Arthritis and Metabolic Diseases

J. E. Rall, M.D., Ph. D., Director of Intramural Research

Robert S. Gordon, Jr., M.D., Clinical Director

Clinical Associates

The NIAMD appoints approximately nine Clinical Associates each year. The assignments are for 2 years, and are ordinarily not extended, although outstanding Clinical Associates may be considered for subsequent appointments to other positions. Each Clinical Associate is attached for his full period of active duty to one clinical branch or section, within which he carries out both investigative and clinical work. He is, in effect, an apprentice clinical investigator working both in the laboratory and on the wards under the guidance of a preceptor established in the field.

The chiefs of Branches or Sections to which Clinical Associates may be appointed, and the Clinical Director, interview applicants and select candidates for these positions. Vacancies do not necessarily occur in each program area each year. Following are brief descriptions of research programs which will be of interest to Clinical Associate applicants. The Program Area Selection Check List includes only those having vacancies to be filled at this time.

CONTROL OF RHEUMATOID ARTHRITIS AND RELATED DISEASES (John L. Decker, M.D.)—With the ultimate purpose of gaining an understanding of the pathogenesis of connective tissue disease, studies on possible etiologic and therapeutic modalities are in progress. Synovial tissue is being subjected to microbiological evaluation. The role of synovectomy in rheumatoid arthritis is under clinical analysis, and the metabolism of therapeutically administered gold salts, as related to clinical responsiveness, is under investigation using activation analysis. The program involves detailed study of disease evolution in patients.

IMMUNOCHEMISTRY (Henry Metzger, M.D.)—Various problems related to the structure of immune globulins are under investigation. For these studies the techniques of immunology (precipitin analysis, hapten-binding, gel diffusion) and protein chemistry (column chromatography, ultracentrifugation, etc.) are being utilized.

IMMUNE GLOBULIN SYNTHESIS (Norman Talal, M.D.)—Integrated experimental and clinical approach to the problem of immune globulin and antibody synthesis. In the laboratory, studies on the role of polyribosomes and RNA in spleen protein synthesis are directed toward detecting changes following primary and secondary antigenic stimulation in rodents. Clinically, immune globulin synthesis is being studied in patients with Sjogren's syndrome, lymphoma, macroglobulinemia and amyloidosis. Techniques include cell fractionation, *in vitro* and cell-free protein and RNA synthesis, sucrose gradient analysis, immunoelectrophoresis and immunodiffusion.

BIOCHEMISTRY OF THYROID HORMONES (Jacob Robbins, M.D., Jan Wolff, Ph. D., M.D., and staff)—The thyroid section encompasses work in most areas of thyroid biochemistry, ranging from basic disciplines of organic and physical chemistry (e.g., mechanisms of thyroxine synthesis, physical chemistry of thyroglobulin) to more biological areas of interest (e.g., transport of iodide by thyroid cell membrane, biochemistry of natural iodoproteins, metabolism of thyroid cells, proteolytic systems of the thyroid, iodine kinetics). It includes work on selected aspects of thyroid disease.

STEROID HORMONE METABOLISM, NEUROENDOCRINOLOGY (Saul W. Rosen, M.D., Ph. D.)—The steroid hormone section encompasses work on gonadal disorders (e.g., hypogonadotrophic hypogonadism), the neuroendocrine regulation of gonadal function (e.g., immunoassay of gonadotrophic hormones), gynecomastia caused by neoplasms and by nonovarian steroids.

DISORDERS OF INTERMEDIARY METABOLISM IN GOUT AND AMINOACIDURIAS (J. Edwin Seegmiller, M.D.)—The principal interest of this laboratory is the biochemical basis of inherited human diseases in terms of derangements of intermediary metabolism. Also being investigated is the precise mechanism by which the basic biochemical defect produces the clinical pathological

state. Possible approaches to therapy of such disorders as gout and cystinosis are being explored.

DIABETES AND INTERMEDIARY METABOLISM (Jesse Roth, M.D.)—This section encompasses work on the regulation of metabolic pathways (e.g., intermediary carbohydrate metabolism in man), inborn errors in metabolic pathways (e.g., galactosemia, cystinuria), and amino acid transport by cells. The mechanism of action of insulin and its metabolism are under study. It also includes work on selected problems concerned with clinical diabetes and hypoglycemia.

BIOCHEMICAL ASPECTS OF GASTROINTESTINAL TRACT DISORDERS (Leonard Laster, M.D.)—The primary concern of this group is to correlate facets of the biochemistry, physiology and pathology of organs of the gastrointestinal tract with clinical disease. Major interests include the metabolism and transport functions of the small-intestine mucosa, derangements of these processes in patients with malabsorption due to various diseases, and alterations in organs of the gastrointestinal tract in patients with inborn errors of metabolism. At present, studies are directed primarily toward patients with malabsorption and patients with the inborn errors of methionine metabolism, homocystinuria and cystathioninuria. The basic enzymatic defects underlying the latter two diseases have been demonstrated and the biochemical consequences of these defects are under study.

MINERAL METABOLISM (G. D. Aurbach, M.D.)—Studies in progress are concerned with the structure, mechanism of action, and immunoassay of polypeptide hormones. This work is particularly directed toward the detection and characterization of parathyroid hormone in clinical disorders of parathyroid function and in metabolic bone disease. Clinical metabolic studies involve investigation of patients with disorders of bone (osteoporosis, osteomalacia, hyperparathyroidism, Paget's disease) by means of metabolic balance and bone-seeking radioisotopic studies. Mineral turnover, deposition and resorption, and gastrointestinal absorption of minerals are studied under the influence of hormones and nutritional factors, with a view toward uncovering the mechanism of action of these factors and the nature of the metabolic derangements in these diseases.

CYSTIC FIBROSIS AND OTHER TYPES OF PANCREATIC ACHYLIA (Paul A. di Sant' Agnese, M.D.)—Currently most of our time is being devoted to cystic fibrosis. By biochemical and immunological means, antigenic determinants common to all organs and tissues are being sought in an effort to uncover and elucidate the basic defect of mucopolysaccharides in this disorder. The abnormal electrolyte metabolism of the sweat glands is under investigation by both physiological and morphological methods. The relationship of sweat electrolyte concentration to sweat rate and aldosterone administration is being assessed and similar determinations will be undertaken by

micro-puncture of individual glands. The electron-microscopic and histochemical patterns of these organs are under scrutiny. Other studies in cystic fibrosis include determination of albumin metabolism with radioactive isotopes.

Several other types of pancreatic deficiency (e.g., the syndrome of pancreatic deficiency and bone marrow dysfunction, aplasia of the exocrine pancreas, Klinefelter's with pancreatic deficiency, dwarfism and other unusual features) have been recognized recently. They are the object of current interest in order to define them further by clinical and metabolic studies.

IMMUNOHEMATOLOGY AND BLOOD COAGULATION (N. Raphael Shulman, M.D.)—Clinical and laboratory research in the fields of immunohematology and blood coagulation are being conducted. Specialized techniques used are those of protein chemistry (purification and characterization), enzyme chemistry, immunochemistry, complement fixation, and all tests used in clinical and investigative blood coagulation. Topics of clinical investigation are related to laboratory projects. These include immunologic aspects of blood cell deficiency states, problems of "autoimmunity" and homo- and hetero-transplantation, and blood coagulation abnormalities of all types. The branch is responsible for clinical consultation in general hematology throughout the Clinical Center.

Research Associates

The National Institute of Arthritis and Metabolic Disease has four positions available each year for Research Associates. These 2-year appointments, usually beginning on July 1, are designed to give highly qualified physicians an opportunity to improve their background for careers in basic medical research. During his stay here, each Research Associate will devote the larger part of his time to participation in laboratory research under the immediate supervision of a preceptor. The Research Associate, approximately 1 year prior to beginning, will visit NIAMD to select the laboratory and preceptor with whom he wishes to work. Candidates desiring further information about the laboratories, staff and bibliography of NIAMD may obtain this by writing to Dr. J. E. Rall, Director of Intramural Research, NIAMD, National Institutes of Health, Bethesda, Md., 20014.

Staff Associates

A variable number of openings for Staff Associates are available. These positions are for laboratory research under the guidance of a preceptor. Candidates are selected for interviews with the investigator with whom they will work and are appointed for a 2-year period. Those interested in a list of preceptors for this program may write Dr. Rall at the address given above.

National Institute of Child Health and Human Development

Donald Harting, M.D., Director

Roy Hertz, Ph. D., M.D., Scientific Director

This relatively new Institute offers Associate Training Programs in four areas: Reproductive Biology, Child Health and Development, Mental Retardation, and Aging. These programs include activities of interest to those with a variety of medical specialty training (including pediatrics, obstetrics, gynecology, internal medicine, psychiatry, surgery and anesthesiology), as well as to those with basic science interests (including embryology, genetics, pharmacology, and psychology).

Clinical, Research, and Staff Associate appointments are available in each of the program areas. Brief descriptions of activities of these follow.

Reproductive Biology Program

This program (under the direction of Roy Hertz, Ph. D., M.D.) is concerned with studies of the growth, development, and function of the generative organs of man and other mammals, including interactions with other endocrine organs. In this program area, two branches will appoint associates.

THE BIOLOGY BRANCH is concerned with the investigation of problems relating to the physiology of reproduction and development in primates and other laboratory animals.

THE ENDOCRINOLOGY AND METABOLISM BRANCH is concerned with many aspects of this broad field. Facilities include a general endocrine ward, admitting patients of all ages, and basic research laboratories. Particular emphasis is placed upon (1) Protein and Polypeptide Hormones, including measurement, physiology, biochemistry and mechanisms of action. (2) Cytogenetic Studies of Endocrine Syndromes, particularly disorders of gonadal development and function.

Growth and Development Program

This program (under the direction of Dwain N. Walcher, M.D.) is concerned with biological, psychological and social processes in normal growth and development, including psycholinguistics and other aspects of language

development. In addition to major emphasis on normal developmental processes, there will be a concern for certain disease entities influencing child health.

Mental Retardation Program

This program (under the direction of Gerald D. La Veck, M.D.) seeks to mount a concentrated research attack on the cause, prevention, diagnosis and treatment of this handicapping condition.

Aging Program

This program (under the acting direction of Leroy E. Duncan, Jr., M.D.) has an associate training program at its GERONTOLOGY BRANCH (Nathan W. Shock, Ph. D., Chief, and Reuben Andres, M.D., Clinical Director) in Baltimore.

The Gerontology Branch is located at the Baltimore City Hospitals. By 1968 it will occupy the new Gerontology Research Center on the campus of the B.C.H. Research at the Gerontology Branch has been characterized by multidisciplinary investigations into theories of the aging process, basic studies on molecular, cellular, and tissue aging, and physiological and clinical investigations in normal man and in selected diseases. Opportunities to physicians for research training in all these areas are available, and an associate will whenever possible be placed in the Section of his choice as discussed at the time of interview.

Research on human subjects and patients is carried out with the cooperation of the Department of Medicine and other clinical departments of the Baltimore City Hospitals. Community dwelling, active, healthy volunteers age 20 to 100 years offer a remarkable group for longitudinal studies. In addition, a patient area is under Gerontology supervision for special studies on selected diseases. Approximately 10 per cent of the Associate's time is spent in participating in the examination and care of these subjects and patients. In addition, where indicated, and with the approval of the preceptor, Associates may participate in clinical activities of the Baltimore City Hospitals and the nearby hospitals of the Johns Hopkins University and the University of Maryland. The Baltimore City Hospitals are teaching hospitals for these institutions.

Associates participate in a seminar conducted by the staff of the Branch, which presents a comprehensive view of research in Aging. They may participate in a dinner journal club. Weekly research conferences are presented by members of the staff and invited lecturers. Associates have an opportunity to present their research in this series.

The Gerontology Branch maintains a long-term colony of various species of animals. Animals of specific ages over the entire life span of the species

are immediately available for approved research projects. This enables the Associates to complete their studies within their 2-year tenure. A third year appointment will generally be available when extension is mutually agreed upon. Preference is given to applicants who intend to pursue careers in investigative and academic medicine. Research experience is desirable but not essential to appointment.

The heads of the sections of the Gerontology Branch are listed below. Further information concerning the activities of any of these should be obtained by writing to Dr. Rubin Andres, Clinical Director, Gerontology Branch, NICHD, Baltimore City Hospitals, Baltimore, Md., 21224.

Biophysics—Harry Elden, Ph. D.

Cellular and Comparative Physiology—Bernard Strehler, Ph. D.

Comparative Biochemistry—Rao Sanadi, Ph. D.

Endocrinology—Robert Gregerman, M.D.

Longitudinal Studies—N. W. Shock, Ph. D.

Metabolism—Reubin Andres, M.D.

Molecular Biology—Gunther Eichhorn, Ph. D.

Nutritional Biochemistry—Charles Barrows, Sc. D.

Sections of Cardiovascular Physiology, Morphology, Pulmonary and Renal Physiology will also be established by 1968.

National Institute of Dental Research

Seymour J. Kreshover, D.D.S., M.D., Ph. D., Associate Director in Charge
of Research

Edward J. Driscoll, D.D.S., Clinical Director

The National Institute of Dental Research conducts a broad program in the biological and physical sciences which are basic to medical and dental problems. Both physicians and dentists are appointed to laboratory as well as clinical areas. Following are brief descriptions of the programs to which Associate appointments may be made.

THE LABORATORY OF BIOCHEMISTRY (F. J. McClure, Ph. D., Chief) includes programs of basic research on proteins, enzymes, and nucleic acids, on biological processes of calcification, connective tissue maturation, and enzyme action, and on disease processes, including caries, congenital anomalies, and connective tissue pathoses. These studies are conducted with the techniques, instrumentation, and biological materials used by physical

chemists, organic chemists, biochemists, nutritionists, physiologists, and anatomists. The objectives of this Laboratory are to contribute to an understanding of basic biochemistry for application to the fundamentals of disease processes and to develop approaches for the prevention and treatment of oral disease.

Current topics of research include: the structure and chemistry of collagen and the mechanism of its crosslinking; the chemistry of elastin and the biosynthesis of its crosslinks; structure-function relationships in pathological processes involving connective tissue; physiological and pharmacological aspects of teratogens in experimental animals; the mechanism of action of enzymes; the chemistry and mode of action of soluble ribonucleic acids; physical chemistry of proteins; *in vitro* studies on calcification; calcification of bones and teeth and the role of fluoride; the biochemistry of saliva; the effects of dietary deficiencies and supplements on dental caries.

THE LABORATORY OF MICROBIOLOGY (Henry W. Scherp, Ph. D., Chief) has as its broad objective the elucidation of the microbial ecology of the oral cavity, that is, to understand the interactions of members of the oral microbiota with one another and with the tissues of the host in which they reside, particularly in reference to oral health and disease. Though the Laboratory's programs derive from concern with such diseases as dental caries, periodontal disease, and pathoses of the oral soft tissues, they necessarily include supportive fundamental studies in microbial taxonomy, microbial physiology, immunology, experimental pathology, gnotobiotics, and virology. Cooperative research with other laboratories and branches is conducted as required by the interdisciplinary nature of particular projects.

Current interests of this Laboratory include study of streptococci as specific transmissible agents of caries; specific transmissible periodontal pathosis of hamsters caused by a filamentous organism; immunochemistry and physiological effects of endotoxins from microorganisms implicated in periodontal disease; histolytic enzymes of microorganisms residing in the gingival sulcus; pathogenesis of experimental infections with oral microorganisms in normal and germfree animals; taxonomy of oral actinomycetes, lactobacilli, streptococci, spirochetes, and veillonellae; immunochemical relationships of oral bacteroides, fusobacteria, and leptotrichiae; genetic and dietary influences in experimental caries of rodents; biochemical basis of cellular differentiation in the slime mold *Dictyostelium discoideum*; intermediary metabolism of carbohydrates by oral lactic-acid bacteria and veillonellae; biosynthesis and function of folic acid; mechanism of cell killing and recurrent infection of herpes simplex virus; serological relationships of herpes simplex virus; pathogenesis of infection with lactic-dehydrogenase virus; pathogenesis of intraoral ulcerations; allergic reactions of oral mucosa; role of oral microorganisms in formation of dental calculus.

THE LABORATORY OF HISTOLOGY AND PATHOLOGY (Marie Nylen, D.D.S., Acting Chief) is concerned with three general research areas—physical biology, histochemistry, and experimental pathology. Although there is considerable overlapping in these activities, assignment of the candidate as well as preceptorial guidance will normally fall into one of these subdivisions.

The studies in physical biology are a broad series of projects concerned with normal and pathologic embryology, anatomy and properties of various mineralizing tissues, basic crystal chemistry of calcium phosphates and related compounds, and the morphological characteristics of whole and fractionated tissue cells, microorganisms and viruses. Opportunities for cooperative research and training are offered in electron microscopy and diffraction, contact and projection microradiography, X-ray diffraction, and infrared absorption spectrophotometry, as well as other standard laboratory techniques.

In histochemistry, investigations are directed toward the determination of the composition and enzymatic activities of normal and diseased mineralized and nonmineralized connective tissues. Standard and experimental histochemical and microchemical methods, both qualitative and quantitative, are employed. Other studies are in progress on a collagenase detected in gingival tissues, and on the development of technics to correlate histochemical with electron microscopic methods.

The activities in experimental pathology are largely limited to investigation of factors influencing the initiation, transmission and inhibition of dental caries and periodontal disease. A wide variety of basic animal experiments are conducted as well as clinical trials, as indicated, of promising therapeutic agents and procedures.

THE EPIDEMIOLOGY AND BIOMETRY BRANCH (Albert L. Russell, D.D.S., M.P.H., Chief), is concerned with the study of the occurrence of oral diseases in relation to various characteristics of the persons examined, their way of life, and the environment in which they live. Field studies are designed and conducted in an effort to identify, within this dynamic complex, variables which influence either favorably or unfavorably the occurrence of disease. The objective of epidemiological study is to provide information that might prove useful in the prevention, control or treatment of disease.

Research activity of the Branch is currently devoted to the epidemiological study of dental caries, periodontal disease, and occlusion. These processes represent by far the three most prevalent problems of oral health. A large-scale study of relationships between nutritional status and oral diseases also is in progress.

Investigations conducted by this Branch have contributed to the understanding of oral diseases in the following areas: the fluoride dental caries relationship, including the caries inhibitory effect of fluoridated water; the

development of an acceptable and reliable method for assessing the occurrence of periodontal disease in populations; the high worldwide prevalence of periodontal disease and an appreciation of the major public health problem created by this disease; the close association between the occurrence of dental plaque, calculus deposits, and periodontal disease; the relationships between nutritional status and oral diseases in various populations.

THE ORAL PHARYNGEAL DEVELOPMENT PROGRAM (James F. Bosma, M.D., Chief) is concerned with the development of form and of respiratory and feeding functions in normal and in impaired infants and children. The staff of pediatricians, orthodontists, and speech specialists collaborates in study and therapy of inpatients and outpatients. Study methods are varied, and commonly include standard and cephalometric radiology, cineradiology, cinephotography, and speech recording and analysis. Particular efforts are made to adapt familiar study techniques and therapies to patients severely handicapped by anomaly or neurological impairment.

Basic investigation is conducted in relevance to clinical problems, including studies of cephalic skeletal growth in a variety of mammals and studies of brain stem mechanisms and motor coordinations of swallow and vocalization.

THE HUMAN GENETICS BRANCH (Carl J. Witkop, Jr., D.D.S., Chief) conducts projects in cellular, clinical, and population genetics, with the objective of elucidating the genetic mechanisms in various diseases and normative traits.

In these studies, a wide variety of approaches are utilized, ranging from basic biochemical, immunochemical, and cytological to mathematical and computer techniques. In addition, clinical skills in both medicine and dentistry are called upon. At the molecular and cellular level, specific studies are concerned with the immune mechanisms, cell growth, biochemical basis of differentiation, cellular handling of genetic information, and chemical characterization and genetic control of salivary constituents. More clinically oriented studies involve such hereditary defects as deafness, renal disease, albinism, defects of enamel and dentin, speech and masticatory abnormalities. Population studies of congenital malformations, inbreeding effects in isolated populations, inherited hemoglobinopathies and blood groups are also in progress.

Recent achievements of the Branch include: The demonstration of a relationship between the inherited ability to taste phenylthiocarbamide and susceptibility to dental caries; an indication of two types of recessive albinism in man with different biochemical bases; clarification of the role of tetracycline administration during odontogenesis as a cause of tooth defects; the finding of genetically determined biochemical defects associated with speech and masticatory disorders; elucidation of genetic and environmental factors

in individual differences in salivary constituents; contributions to knowledge of nucleic acid metabolism and mechanisms of mitotic stimulation in normal cells.

National Institute of Mental Health

John C. Eberhart, Ph. D., Associate Director for Intramural Research
Robert A. Cohen, M.D., Ph. D., Director of Clinical Investigations

This Institute offers an opportunity for post-doctoral research training in psychiatry and in the biological and behavioral sciences. Clinical Associates are assigned clinical and research responsibility with approximately one-half time for each endeavor. Research Associates engage both in laboratory research and in formal tutorial seminars in biochemistry, pharmacology, neurophysiology, and the behavioral sciences under the preceptorship of one of the senior staff. Staff Associates are engaged primarily in laboratory research under the preceptorship of a senior investigator. Staff Associates may secondarily participate in didactic training as laboratory commitments and personal interests may coincide.

Lectures, seminars, and group discussion by members of the staff and by visiting lecturers complement the training program, making it possible for Associates to acquire a broad background in the neural and behavioral sciences with more intensive and individualized study in selected aspects of the field.

It should be noted that clinical experience in the NIMH emphasizes the opportunity to learn to use a ward and its staff for research purposes as well as for treatment. An opportunity is provided to administer a research ward for the treatment of psychotic patients emphasizing community oriented milieu therapy and utilizing various patient and patient-family groups as the major therapeutic instruments.

Descriptions of the NIMH program areas to which Associates will be appointed follow.

THE ADULT PSYCHIATRY BRANCH (Lyman C. Wynne, M.D., Ph. D., Chief) conducts a program of research into various aspects of the causes and treatment of mental illness and emotional disturbances. Studies are currently being carried out in the following areas: (1) Family and Twin Studies—clinical and experimental study of interaction in the families of disturbed adolescents and young adults; comparison of schizophrenic and nonschizophrenic families, especially in terms of cognitive style and patterns of relatedness and affective expression; comparison of schizophrenic and non-

schizophrenic siblings and twins within the same family; developmental and cross-cultural aspects of schizophrenia; techniques and indications for family psychotherapy in comparison to individual therapy and group therapy; (2) Personality Functioning and Development—cognitive and attentional mechanisms in schizophrenics, other psychiatric patients, and normals; hospital and field studies of factors that facilitate and impair the development of identity, self-concept, and problem-solving effectiveness in adolescence; neurotic and psychotic reactions on going away to college; sources of effective coping behavior in periods of major transition; cross-cultural aspects of adolescent development; (3) Psychosomatic Medicine—problems in the area of biology and behavior, specifically dealing with behavioral and neuroendocrine processes in the affective disorders; neurochemical correlates of behavior in experimental animals; and biological factors related to stress which may, in turn, change or alter behavior; (4) Psychophysiology of Sleep—the interrelations of physiological and subjective aspects of sleep and dreaming are being explored with the goals of understanding both the basic processes and the possible clinical significance of these functions in psychopathological states such as depression and schizophrenia.

THE CHILD RESEARCH BRANCH (Wells Goodrich, M.D., Chief) conducts a program of correlated research projects on personality and family development. Longitudinal and cross sectional studies of families living in the community are conducted by an interdisciplinary staff of psychiatrists, psychologists, social workers and teachers. The aim of this program is to define patterns of adaptation and response in newborn infants, preschool children, young married couples and young parents. Congenital infant factors, interpersonal behavior in the family, and personality development are interrelated in the following study areas: (1) Infant Studies—observations of infants in the first few days of life are carried out in local hospitals. Patterns of behavior believed to indicate enduring traits are followed longitudinally through observations in a nursery school laboratory; (2) Longitudinal Family Studies—a number of marriages are followed for several years by means of questionnaires, experimental problem-solving procedures and interviews; (3) Intensive Case Study—selected families are studied more intensively to explore changing interaction patterns. Interaction sequences are recorded on sound film for later analysis; (4) Parent-Infant Studies—interaction patterns between parents and infants are investigated over the first three months of life. Of central concern are those factors determining the degree and quality of maternal contact. The attributes of the mother and infant are considered in investigating these phenomena.

THE LABORATORY OF CLINICAL SCIENCE (Seymour S. Kety, M.D., Chief. Senior Staff: Dr. Julius Axelrod, Dr. Philippe V. Cardon, Jr., Dr. Jack

Durell, Dr. Edward V. Evarts, Dr. Marian W. Kies, Dr. Irwin J. Kopin, and Dr. Louis Sokoloff) conducts a program of research in biochemistry, pharmacology, physiology, medicine, and psychiatry and the interrelationships among them. Current research includes: (1) Mechanism of action and metabolism of drugs and hormones which act in the nervous system, especially catecholamines; (2) thyroxine action on protein synthesis; (3) biochemical studies in endocrine and metabolic disorders and in disease of the autonomic nervous system, including metabolism of amino acids, catecholamines, and other biogenic amines; (4) biochemical studies on myelin; autosensitization reactions in the central nervous system; (5) unit activity in cortical and subcortical areas in relation to sleep and attention; (6) cerebral circulation and metabolism; (7) circulatory physiology and psychosomatic medicine; (8) longitudinal investigation of patients (acute or episodic psychosis, depression) stressing biological factors (endocrine function, catecholamines, serum proteins, specific enzyme activities), and interpersonal factors (dynamics of family interaction, group process, milieu therapy) which vary with clinical course.

THE CLINICAL NEUROPHARMACOLOGY RESEARCH CENTER (G. C. Salmou-
raghi, M.D., Chief. Fritz A. Freyhan, M.D., Deputy Chief in Charge of
Clinical Studies)—The NIMH Research Staff participates in patient care
and conducts a variety of clinical investigations on the William A. White
Service, which includes a day hospital, followup clinic, and home visiting
service in addition to the usual inpatient facilities. Currently these include:
(1) longitudinal studies of patients and families with personality and
psychotic disorders, focusing on psychopathological and psychosocial factors
which influence clinical course, treatment response and social functioning;
(2) comparative evaluations of therapies and of therapeutic settings for
patients with functional disorders; (3) studies in clinical psycho-
pharmacology with particular emphasis on methodology of treatment
evaluation; and (4) experimental studies of physiological and biochemical
factors associated with mental disorders.

In addition, neurochemistry and psychopharmacology investigations include studies on the effects of drugs on the intracellular distribution, binding and release of neurohumors in animal tissue; the regional distribution of neurohumors in the brain; the assay of biogenic amines and their metabolites in body fluids; the intermediate metabolism of phenothiazines; the metabolism of psychoactive tryptamine derivatives; and various problems in the regional pharmacology of the brain.

Neurophysiology investigations include microelectrode and micropipette studies on the effect of drugs applied to single cells in various areas of the brain. Special techniques developed at the center are employed in these investigations.

Supervised facilities for Ph. D. work can be provided by the center subject to sponsorship by universities. The university department concerned must be approved by the laboratory or branch chief.

THE LABORATORY OF NEUROBIOLOGY (Ichiji Tasaki, M.D., Chief) conducts research on a variety of excitable cells and tissues, including the brain, using mainly neuroanatomical, neurophysiological, biophysical, and behavioral techniques. This interdisciplinary brain research program seeks an improved understanding of basic neurobiological mechanisms, including those mechanisms underlying perception, learning, memory, judgment and other complex functions. Specifically, studies are carried out on: (1) The physical and biochemical mechanisms underlying electrophysiological events in membranes and synapses; (2) the central controls governing transmission along sensory pathways; and (3) the general principles of integration linking higher sensory and motor pathways in spinal cord, brainstem, and cortex.

THE LABORATORY OF GENERAL AND COMPARATIVE BIOCHEMISTRY (Giulio L. Cantoni, M.D., Chief) conducts investigations on: Mechanisms and pathways of protein biosynthesis; biological methylations; mechanisms of biological oxidations including oxidation reactions; and alkaloid biosynthesis.

The main focus of the laboratory is on the molecular biology of S-RNA including determination of the base sequence of purified S-RNAs, interaction with messenger RNA and ribosomal particles, biological coding, enzymology of S-RNA, physicochemical studies, etc.

The Section on Cellular Regulatory Mechanisms has a broad program on biological oxidation. The enzymes and coenzymes involved in the oxidation of phenylalanine and DOPamine, are being studied from the point of view of their mechanism, control and biosynthesis.

The Section on Alkaloid Biosynthesis studies the enzymes involved in alkaloid biosynthesis, their control and biosynthesis in relation to morphogenetic development of the plant; also, enzymatic mechanisms of transmethylation and intermediary metabolism of sulfur-containing amino acids in various conditions.

THE SECTION ON PHYSICAL CHEMISTRY (Dan F. Bradley, Ph. D., Chief) conducts a program of research focusing on the structure and function of biological polymers. Studies in this general area are carried out using light absorption, fluorescence, optical rotatory dispersion, ultracentrifugation, viscosity, flow birefringence, and dichroism, X-ray diffraction, chromatography, fast reaction kinetics, quantum mechanical calculations, and digital computer techniques.

Current projects include studies on the dye-stacking theory of metachromasia, the molecular structure of antibodies, the anionic charge density in the squid axon membrane, the quantum mechanical theory of hypo-

chromism in nucleic acids, and induced optical activity in helical biopolymer-dye complexes.

THE LABORATORY OF NEUROPHYSIOLOGY (Wade H. Marshall, Ph. D., Chief) conducts a program in basic neurophysiology on problems ranging from basic membrane mechanisms to brain and behavior. Current investigations include (1) Brain and behavior with particular emphasis on the limbic system; (2) physiology and biophysics of membrane; (3) physiology of spinal cord; and (4) general neurophysiology of the brain.

THE LABORATORY OF PSYCHOLOGY (David Shakow, Ph. D., Chief) conducts investigations in: (1) creativity—the nature of originality in problem-solving of a selected group of talented persons in the context of personality qualities, familial background and environmental supports for such behavior; (2) the development of social exploratory and intellectual behavior in the infant and preschool child as modified by learning, the improvement and refinement of techniques for measuring the physical and mental growth of children from birth through the first 3 years of life, the test of the ability of these techniques to predict future performance, and studies focused upon family syndromes that may contribute to variations in intellectual, social and emotional adjustment; (3) the psychotherapy process in its relation to its fundamental character as communication, especially as revealed in kinetic and linguistic elements of recorded interviews and sound films; (4) the basic psychology of schizophrenia, including studies of the nature of preparation for response, perception, thinking, forms of thought disorder, arousal, reaction time and learning, speech behavior, and interpersonal interaction patterns; the effects of biological and pharmacological agents and physiological alterations on schizophrenic behavior; the study of twins and their families, especially genetically identical twins in which one twin has been diagnosed schizophrenic and the other not; the study of persons adopted at an early age who are now suffering from schizophrenia; (5) the nature of thinking and the mediating processes involved in both normal and various pathological groups; the early aspects of the development of such higher cognitive processes in children at nursery school level; (6) the nature of the perceptual process in its basic aspects, particularly in relation to the problems of size constancy and perception of time and motion, both in normal and schizophrenic subjects; (7) neuropsychology—the study of the experimental relations of brain to behavior through the use of both lesions and implanted electrodes; the work falls into several categories: cortical mechanisms in sensation and perception in the visual, auditory and somesthetic systems; cortical mechanisms in problem-solving; cortical and subcortical relations in the regulation of behavior; (8) studies in rats of the effect of varying environmental (e.g. crowding) and genetic situations on locomotion, eating, drinking, grooming, sleep and reproductive activity; (9) quantitative study of

the development in newborn mammals of social behavior, early motivation and learning using ingestive behavior as the index of behavioral change; and its implications for later adult behavior.

National Institute of Neurological Diseases and Blindness

Karl Frank, Ph. D., Acting Associate Director for Intramural Research
Maitland Baldwin, M.D., Clinical Director

Descriptions of the NINDB program areas to which Associates will be appointed follow. For Clinical Associate appointments, preference is given to applicants who have completed at least 1 to 2 years of residency in either neurology, neurosurgery, medicine, or ophthalmology.

THE MEDICAL NEUROLOGY BRANCH (W. King Engel, M.D., Chief) has as its major function the application of basic research techniques to the investigation of clinical neurological problems. The Clinical Associate during his tenure becomes acquainted with a majority of the neurological diseases, with particular emphasis on the disorders of muscle, myasthenia gravis, lower motor neuron diseases, metabolic abnormalities of the central nervous system, and genetically determined disorders. He receives instruction in clinical neurology and the related clinical and basic sciences while developing an understanding of the various laboratory techniques which support the neurological investigation. During the 12 months that he is in a ward environment he is responsible for the care of patients on the Medical Neurology Service and the integration of related research. The second year is spent applying one of a variety of basic laboratory techniques (such as histochemistry, tissue culture, biochemistry, immunology, or electromyography) to a clinical problem. The senior Clinical Associates participate in the consulting service.

THE SURGICAL NEUROLOGY BRANCH (Maitland Baldwin, M.D., Chief) is concerned with the investigation of epilepsy, involuntary movements, head injury, developmental disorders, brain tumor, cerebral edema, effects of surgical lesions on the nervous system, psychological assessment of surgical lesions, the application of anesthesia to neurological disease states, and problems of hypothermia as related to the nervous system.

The Clinical Associate is required to study and has responsibility for the care of patients with epilepsy, involuntary movements, brain tumors, vascu-

lar malformations of the nervous system, and others with a miscellany of neurological disease. He receives practice and instruction in clinical neurology, and, in particular, in the diagnostic techniques of surgical neurology and the operative techniques of neurological surgery as well as the principles on which these techniques are based. He attends clinical rounds in Medical Neurology, staff conferences in electroencephalography and X-ray diagnosis, as well as neuropathological conferences. He is advised to acquire as great a familiarity with the various laboratory techniques as is commensurate with his individual responsibilities and the commitments of the various laboratories in the NINDB.

THE OPHTHALMOLOGY BRANCH (Ludwig von Sallmann, M.D., Chief) has clinical programs with the following disease groups: Uveitis, glaucoma, retinal degenerations, vascular retinopathies, tumors of the eye, and cataract.

There are five laboratory sections: (1) Neurophysiology (Head, Dr. M. Fuortes)—fundamental investigations on the mechanism of vision and psychophysical studies; (2) Cell Biology (Head, *vacancy*)—studies on Na-K activated ATPase in relation to active transfer processes in biologic systems; (3) Pharmacology (Head, Dr. F. Macri)—studies on aqueous dynamics and intraocular pressure; on pressure and perfusate flow rates in intraocular vessels; (4) Histology and Cytology (Acting Head, Dr. L. von Sallmann)—cell population dynamics studies on eye tissue; (5) Collagen Chemistry (Head, Dr. M. Lewis)—physicochemical studies on collagen of the cornea, sclera, and vitreous body.

THE ELECTROENCEPHALOGRAPHY BRANCH (Cosimo Ajmone Marsan, M.D., Ph. D., Chief) involves a relatively small highly specialized patient population from the entire Clinical Center. One Clinical Associate position is available for a 1-year appointment (preference is given to persons with basic neurological training). In neurophysiology one position (Research Associate) is available. Appointment is for 2 years (preference is given to people with some previous experience in the field of electrophysiology and a knowledge of neuroanatomy). Current research: Experimental epilepsy, thalamo-cortical relationship, nature of brain waves, etc.

LABORATORY OF NEUROCHEMISTRY (Donald B. Tower, M.D., Ph. D., Chief) directs research toward the elucidation of the chemical attributes of neural tissues which underlie the normal functioning of the nervous system and the derangements of function in various neurological diseases. The investigations, which are primarily at the basic level, are distributed among four sections of the laboratory: the Lipid Chemistry Section, the Enzyme Chemistry Section, the Section on Amino Acids and Electrolytes, and the Physiology and Metabolism Section. In these investigations a wide variety of disciplinary approaches and methodologies, including appropriate clinical material, are being utilized. Special emphasis is given to the relevance of

the various laboratory programs to neurophysiological problems, such as mechanisms subserving reception, conduction and transmission of nerve impulses, and to clinical problems, such as the bases for the lipodystrophies, demyelinating diseases, epilepsy, cerebral edema, and nutritional and genetically-determined disorders.

THE LABORATORY OF MOLECULAR BIOLOGY (Ernst Freese, Ph. D., Chief) examines chemical alterations of the hereditary material and control mechanisms of enzyme synthesis and function.

(1) Alterations in the information content of chromosomes can be induced by many agents that attack DNA. The laboratory utilizes the transforming system of *Bacillus subtilis* to determine which types of primary lesions in DNA are induced by different agents and what their ultimate genetic effects are, i.e. DNA inactivation, chromosomal breaks or different types of mutations. These biological findings are then correlated to the chemical and physical chemical analysis of the alterations of nucleotides and DNA.

(2) Control mechanisms of enzyme synthesis and function are the basic elements of differentiation. These mechanisms can be analyzed at the biological level by determining which compounds inhibit, repress or induce specific enzymes, and they can be analyzed at the molecular level, e.g. by the frequency of different soluble RNA molecules at different stages of development. The particular systems being studied in detail are those of sporulation and germination of *Bacillus subtilis* and the control of dehydrogenase enzymes in this organism.

THE LABORATORY OF NEUROPATHOLOGY (Jan Cammermeyer, M.D., Acting Chief) recognizes that an accurate appreciation of pathologic manifestations in microscopic structures is essential for an understanding of the underlying mechanism and exact diagnosis of diseases in the human central nervous system. Primary emphasis is given to basic alteration of cellular morphology of properly prepared histologic material obtained under various experimental conditions. Laboratory projects are conducted by both individuals and groups, and appropriate independent investigations are encouraged. Familiarity with general pathology is preferable for all staff members.

THE LABORATORY OF NEUROPHYSIOLOGY (Wade H. Marshall, Ph. D., Chief) conducts a program in basic neurophysiology on problems ranging from basic membrane mechanisms to brain and behavior. It has a Section on Spinal Cord currently headed by Phillip G. Nelson, M.D., Ph. D., of the National Institute of Neurological Diseases and Blindness; its other sections, however, come under the direct purvue of the National Institute of Mental Health.

LABORATORY OF NEUROANATOMICAL SCIENCES (Alfred J. Coulombre, Ph. D., Chief)—The concepts and methods of a number of disciplines including morphology, physiology, embryology, and biochemistry are used to explore the structure, composition and function of the sense organs, the nervous system and the effector organs. Although the specific problems under study reflect current interests and competencies of the staff, most of the major components of the sensory, nervous and motor systems are under active investigation each year in the four sections into which the laboratory is divided: The Section on Functional Neuroanatomy, the Section on Experimental Neurology, the Section on Neurocytology, and the Section on Experimental Embryology.

Candidates for Research Associate positions in this laboratory usually must have had research experience under the guidance of an established investigator.

THE LABORATORY OF PERINATAL PHYSIOLOGY (R. E. Myers, M.D., Ph. D., and staff), located in San Juan, P.R., functions within the basic neurological disciplines as well as sustaining a program in clinical neurology. Areas of specific involvement follow. (1) *Experimental Neuropathology* utilizes biochemical, cardiovascular and descriptive neuropathological approaches to explore problems of anoxic brain damage and cerebral palsy. (2) *Physiological Psychology* is concerned with the identification and characterization of neural mechanisms underlying psychological functions such as perception, memory and learning. This approach includes the application of the modern techniques of electroneurophysiology. (3) *Comparative Neurology* is involved with defining patterns of brain organization using neuroanatomical degeneration techniques. A major focus of attention is upon connectionism of the monkey brain. (4) *Social and Reproductive Behavior*—With the development of experimental enclosure facilities studies will be initiated investigating brain mechanisms underlying social and instinctual behavior. (5) *Primate Ecology*—The unique colonies of free-ranging monkeys on off-shore islands have enabled studies of a broad range, including population dynamics, social behavior, maternal-infant interrelationships, and reproductive activity. (6) *Developmental Neurology*—The availability of large numbers of dated monkey pregnancies within the Laboratory has enabled studies within the broad area of development utilizing techniques of morphology, physiology or biochemistry.

The Collaborative and Field Program of NINDB

THE PERINATAL RESEARCH BRANCH'S SECTION ON INFECTIOUS DISEASES (John L. Sever, M.D., Chief) (1) develops and utilizes large-scale serological methods to study the relation between viral, protozoal, bacterial infections, and birth defects and related abnormalities; (2) conducts in-

vestigations on viruses, protozoa, and bacteria, to produce antisera to these agents and to determine the effects of these microorganisms on the animals and fetal tissues; (3) investigates recovery of infectious agents and chromosome changes in fetal tissue specimens; (4) studies the effects of specially selected viruses on human volunteers and other populations to determine their pathogenicity.

National Institute of General Medical Sciences

Frederick L. Stone, Ph. D., Director

George J. Cosmides, Ph. D., Coordinator, Pharmacology-Toxicology
Programs

Research Associates in Pharmacology

Program Purpose

Under a new program for pharmacology Research Associates, young scientists as well as more mature investigators in the clinical and basic sciences will receive 2 or 3 years of postdoctoral training in the laboratories of the various Institutes of the National Institutes of Health.

To increase the number of well-trained scientists in pharmacology and related disciplines, the program is designed for:

- those who are already committed to pharmacology by training or research in the field, and
- those who need intensive research training in pharmacology to make significant progress in their special areas of research.

All National Institutes of Health Research Associates are trained in such areas as applied mathematics, biometrics, organic chemistry, biochemistry, physics, and instrumentation. Those who will train under the new pharmacology research associate program will also study biochemical pharmacology and the mechanism of the action of drugs.

Each Research Associate in pharmacology will have a preceptor who is an NIH scientist. The Associate's work will consist mainly of laboratory research in the biomedical sciences and will not include clinical responsibilities.

Program Areas

Choice of program area depends upon the candidate's previous training. Those who have already been trained or have conducted research in pharmacology may select as a preceptor any senior scientist at NIH. Those who need specific training in pharmacology and wish to broaden their experience in the biomedical sciences may make their selection from the following program areas:

Biochemical-Physiological Pharmacology

Dr. David P. Rall, NCI (Chemical Pharmacology)

Dr. Bernard B. Brodie, NHI (Molecular and Subcellular Pharmacology)

Dr. James R. Gillette, NHI (Enzyme-Drug Interaction)

Dr. Lewis S. Schanker, NHI (Biochemistry of Drug Action)

Dr. Elwood O. Titus, NHI (Drug and Transport Mechanism)

Dr. Elliot Vesell, NHI (Pharmacogenetics)

Dr. Sidney Udenfriend, NHI (Physiological Chemistry)

Dr. Herbert Weissbach, NHI (Enzymes and Metabolism)

Dr. Herbert Tabor, NIAMD (Biochemical Pharmacology)

Dr. Julius Axelrod, NIMH (Pharmacology)

Dr. Eugene C. Weinbach, NIAID (Drug Action at Subcellular Level)

Dr. Daniel Steinberg, NHI (Lipid Metabolism)

Clinical Pharmacology

Dr. Eugene Braunwald, NHI (Clinical Physiology)

Dr. Albert Sjoerdsma, NHI (Experimental Therapeutics)

Dr. Seymour S. Kety, NIMH (Biochemistry and Physiology)

Dr. Irwin J. Kopin, NIMH (Medicine)

Dr. Gian C. Salmoiraghi, NIMH (Neuropsychopharmacology)

Dr. Fritz A. Freyhan, NIMH (Psychopharmacology)

Dr. Stephen I. Szara, NIMH (Psychopharmacology)

Types of Appointments

Candidates for this program may be appointed in a civilian as well as commissioned officer status. Requirements for these two types of appointments are as follows:

CIVILIAN STATUS APPOINTMENTS—United States citizenship and a doctoral degree in a biomedical or related science awarded within the last 5 years preceding the appointment. Applicants with these qualifications should communicate directly with: Program Administrator, Pharmacology-Toxicology Programs, National Institute of General Medical Sciences, Bethesda, Md., 20014.

Candidates with more than 5 years of experience or those who have been admitted for permanent residence in the United States at least 1 year prior to making application may also apply for civilian status appointments. Applicants with these qualifications should request application form PHS 416-1 from: Chief, Research Fellowships Branch, National Institute of General Medical Sciences, National Institutes of Health, Bethesda, Md., 20014.

PUBLIC HEALTH SERVICE COMMISSIONED CORPS APPOINTMENTS—All applicants must be citizens of the United States. Appointments will be available in two categories: (1) *Direct appointments in active reserve*—Applicants must have earned a Ph. D., M.D., D.D.S., D.V.M., Sc. D., D. Eng., or equivalent degree. Those found qualified will receive commissions as Public Health Service Officers at ranks determined by training and experience. (2) *Commissioned Officer Residency Deferment Program*—See Part Two of this catalog for details.

Division of Biologics Standards

Roderick Murray, M.D., Director

The Division of Biologics Standards is accepting applications for Staff Associateships in its Laboratory of Viral Immunology. The laboratory gives preference to applicants with 1 or more years of residency training in pediatrics or medicine but does not require prior experience in virology. Appointments will become effective July 1, 1967 or July 1, 1968, depending on the ability of the laboratory to accept candidates at each time and on the candidates' desires for deferment.

THE LABORATORY OF VIRAL IMMUNOLOGY (Harry M. Meyer, Jr., M.D., Chief) is engaged in a program of virus research with special emphasis on the study of viruses of current or potential importance in the biologics field. Although the laboratory participates in clinical trials of vaccines on occasion, individuals should anticipate spending all or most of their time in laboratory research. Each Staff Associate works under the guidance of a senior member of the professional staff. Projects vary from basic to applied research, depending on the interests of the individual and the needs of the Division. Assignment to this Laboratory offers the opportunity to acquire a foundation in laboratory virology and for this reason would be most valuable to physicians planning academic careers in infectious diseases or related fields.

Office of International Research

Charles L. Williams, Jr., M.D., Chief

Heinz Specht, Ph. D., Assistant Chief for Scientific Affairs

This office, within the Office of the Director of NIH, operates an International Research Career Development Program, which is a broadening of the Associate programs to provide for assignment of approximately five of these Public Health Service Officers each year to research projects and programs overseas being carried out by the Public Health Service or which are of special interest to the Service.

Unusual or unique opportunities exist in foreign countries to pursue studies of substantial importance to medical science and to the health of Americans. Investigations in the field of geographic pathology and epidemiology on an international basis continue to provide important clues to the causes of certain diseases which cannot be studied adequately in our environment. The incidence, for example, of atherosclerosis and cancer is substantially affected by hereditary and environmental factors, and the effect of these factors may be studied best in foreign countries. It has now been shown that susceptibility to coronary artery disease is, in part, related to the nature of the diet, and this was to a major degree confirmed by studies overseas in populations consuming diets substantially different from those of Americans. In the fields of infectious disease, nutrition, and genetics, many important discoveries of direct relevance to the health of the American people have been or could be made by exploiting unusual research opportunities in foreign lands.

A major objective of the International Research Career Development Program will be to attract talented investigators into careers in the Public Health Service. Therefore, in most instances IRCDP Associates will be assigned to U.S. Public Health Service research installations or teams such as the NIH research team at the Pakistan-SEATO Cholera Research Laboratory at Dacca, East Pakistan, and the NIH Middle America Research Unit (MARU) in the Panama Canal Zone. Other U.S. Government research installations that may be considered include the Navy Medical Research Units in Egypt and Taiwan, and the Walter Reed Medical Research laboratories in Thailand and Japan. However, Associates may be assigned to the foreign laboratories and projects of other Federal and private groups when they present special opportunities to extend specific research objectives of the U.S. Public Health Service.

While studies in infectious disease are particularly appropriate overseas, these research units abroad are carrying out and planning studies in a variety of disciplines. In addition, each of the Institutes of the NIH has specific international programs and interests. For example, at the Pakistan-SEATO Cholera Research Laboratory in Dacca, scientists of the National Heart Institute are exploiting a unique opportunity for studying water and electrolyte depletion and repletion phenomena. Investigators in the National Institute of Arthritis and Metabolic Diseases are studying the epidemiology of diabetes in connection with nutrition surveys in foreign countries.

The term of service of the IRCDP Associate will be 2 years. Usually all or most of this term will be spent overseas in a particular overseas research laboratory or unit, but in certain cases, a period of orientation and/or training in the United States will be provided before the assignment abroad. This period can also include language training when appropriate.

Individuals with M.D., D.V.M., Ph. D., or D.D.S. degrees will be eligible, and, in general, some experience in research will be required. Only candidates with excellent academic records and strong recommendations will be considered. Fluency in a language other than English is desirable but not required.

The Office of International Research will review the applications of the candidates and will recommend the most highly qualified of the applicants for Reserve Commissions in the U.S. Public Health Service. They will then review and assign priorities to research programs to which it is proposed to assign IRCDP Associates. Assignments will be determined after consideration of the scientific quality and importance to the U.S. Public Health Service of the research programs proposed, the qualifications and interests of the Associate, and, particularly, the degree to which the research experience would be appropriate as a stage in a Public Health Service career. In each instance a senior investigator will assume responsibility for supervising and acting as preceptor for the Associate. Each Associate will be assigned to a NIH Institute to establish contacts for potential career development of appointees who successfully complete their initial 2-year period of service and wish to continue their research careers with an emphasis on international studies.

Letters requesting further information about the IRCD program should be addressed to the Office of International Research, National Institutes of Health, Bethesda, Md., 20014.

Clinical Center

Jack Masur, M.D., Director

Robert M. Farrier, M.D., Associate Director

Roger L. Black, M.D., Associate Director

The Clinical Center appoints Clinical Associates for the Anesthesiology Department, the Department of Diagnostic Radiology, and the Blood Bank Department. Associates in Anesthesiology and Diagnostic Radiology are expected to have completed their residencies prior to entrance on duty. Applicants for these positions will be selected directly by the department chiefs without recourse to the matching of candidate and program-area preferences. The Blood Bank Department requires only one year of residency training.

THE ANESTHESIOLOGY DEPARTMENT (Clarence L. Hebert, M.D., Chief) offers advanced training—through the Associate program—to medical graduates who have fulfilled residency requirements of the American Board of Anesthesiology, and who have special interest in research. (Senior residents from other hospitals are accepted for brief periods for special training. Arrangements for such assignments must be made well in advance by the director of the residency program.)

The Anesthesiology Department is organized as a central service to provide anesthesiological care for all patients hospitalized at the Clinical Center, NIH. Inhalation therapy and consultative services for special problems (respiratory, pain, etc.) are included.

Four of the National Institutes of Health have surgical services which have active programs in surgical research.

The National Cancer Institute (Surgery Branch) has a long-range program concerned with the performance of extensive radical surgery with special emphasis on the treatment of patients with malignancy of pelvic organs and structures of the head and neck. In addition, various types of other general surgery are done on NCI patients and those patients sponsored by other Institutes, who require surgery during their Clinical Center stay.

The National Heart Institute admits patients for the study and treatment of congenital and acquired heart disease. All types of cardiac surgery are performed, the majority consisting of open-heart operations performed with the aid of extracorporeal circulation. Six or more of these operations are done weekly.

The National Institute of Neurological Diseases and Blindness has several surgical programs including: Ophthalmological surgery; localization and surgical removal of epileptogenic foci within the temporal lobe for the treatment of epilepsy; stereotaxic procedures for the relief of syndromes characterized by abnormal movements and rigidity; and the removal of malignant lesions of the brain with the aid of generalized hypothermia.

The NINDB sponsors a neuroanesthesia laboratory with a full-time research anesthesiologist. Large primate animals are utilized in some of the studies.

The National Institute of Dental Research sponsors a project for the detailed study of physiological variables in ambulatory dental patients undergoing oral surgery under general anesthesia. Various anesthetic agents and techniques are employed in the study.

The clinical workload is relatively light, with the number of anesthetics averaging about 140 per month. Ample time is available for anesthesiologists who wish to spend time in laboratory investigational work. At least 1 day per week is allotted for laboratory work, and additional time is usually available. The animal laboratory facilities of the NHI and the NINDB are available to our staff. Advice and assistance from senior investigators, including outside consultants, are available.

An Anesthesia Research Laboratory is operated as a joint project by the Surgery Branch of the National Heart Institute and the Anesthesiology Department of the Clinical Center.

The Anesthesiology Department staff is comprised of eight full-time anesthesiologists, three nurse anesthetists, three anesthesia technicians, four inhalation therapists, three extracorporeal apparatus technicians, and two secretaries. A visiting anesthesiologist from a foreign country may also be on the staff.

THE DEPARTMENT OF DIAGNOSTIC RADIOLOGY (Betty E. Hathaway, M.D., Chief) offers a 1-year program of advanced training in special study procedures for medical graduates who have completed an internship and an approved 3-year residency in radiology.

The 1-year program of advanced training is in the area of special study procedures which include: Angiocardiography; femoral arteriography; celiac and renal arteriography, selective; inferior venocavography; lymphangiography; carotid and vertebral arteriography; pneumoencephalography and ventriculography; retroperitoneal air studies and gynecography; and radioactive isotope studies of the brain, heart, liver, thyroid, kidneys, spleen, and lungs.

The Department of Diagnostic Radiology of the Clinical Center provides the diagnostic X-ray and radioisotope services for all of the patients from seven Institutes. The clinical material studied radiographically is most

unusual, and many opportunities are available for intramural research programs with the physicians and scientists from the institutes.

Approximately 40,000 X-ray examinations are performed annually on 25,000 patients. The radiographic equipment is excellent. Close liaison is maintained with the radiation therapy department as well as with the radiology departments of local hospitals.

THE BLOOD BANK DEPARTMENT (Paul J. Schmidt, M.D., Chief) is accepting applications for Clinical Associateships under the matching system. Preference will be given to applicants with one or more years of residency training in medicine, pediatrics or clinical pathology. Prior training in immunohematology is not required. Appointment can become effective in 1967 or 1968.

The Department is engaged in a program involving basic and clinical study of blood aging, of the *in vivo* effects of biologic incompatibility, of mechanisms of the alteration of cellular antigens by disease states and of transplantation.

The Clinical Center Blood Bank supplies some 20,000 perishable blood products annually for transfusion to patients with unique hematological and immunological problems. Many opportunities are available for collaborative basic and clinical research. Close professional liaison is maintained with the Clinical Pathology Department.

The program offers training for the internist or pediatrician in the careful laboratory control of a patient-oriented transfusion program as well as advanced training for the clinical pathologist.

PART FOUR

Academic Programs Available to Associates

AMONG the academic programs open to an NIH Associate are: Evening courses provided by the Foundation for Advanced Education in the Sciences, Inc.; formal Seminars under the direction of NIH staff; Combined Clinical Staff Conferences; formal lectures; symposia; and an annual scientific equipment exhibit. The "N.I.H. Calendar of Events" lists an average of 15 to 20 programs each week. Other events of interest are held at universities and other institutions in the Washington-Baltimore area.

Evening Courses

Evening courses are provided by the Graduate Program of the Foundation for Advanced Education in the Sciences, Inc. Established by scientists who subscribe to the view that learning, research, and teaching are mutually reinforcing processes essential to the evolution of science, the Foundation is a non-Federal independent organization as defined by the Government Employees Training Act; however, its tuition and other fees can be paid by a Federal employer. Courses are offered in two semesters, fall and spring; courses are offered at the undergraduate and graduate levels under the programs of its several Departments of instruction: Behavioral and social sciences, biochemistry, chemistry, genetics, mathematics and physics, medicine and physiology, microbiology and immunology, languages, and general studies. Further inquiries regarding the Graduate Program and requests

for its current catalog should be directed to: Registrar, Foundation for Advanced Education in the Sciences, Inc., National Institutes of Health, Bethesda, Md., 20014.

Seminars

An NIH Program of formal tutorial seminars and informal discussion groups is designed in content and emphasis for prospective independent investigators, and gives them the additional opportunity to master selected topics not adequately covered during college or graduate schooling. This program, which is headed by Dr. C. B. Anfinsen, has been developed by a Scientific Advisory Committee consisting of Drs. Robert Berliner (Chairman), C. B. Anfinsen, Roger Cole, Robert Cohen, Hewitt Fletcher, Jr., J. Edward Rall, David Shakow, Herbert Sober, Daniel Steinberg, C. Gordon Zubrod, and Seymour Kety.

These exercises are an integral part of the Associate Program and are geared specifically in that direction. The program accommodates Research, Staff, and Clinical Associates and other properly qualified persons. To maintain the quality of instruction and the intensity of individual identification with the program, a series of "divisions" has been established. Each of these deals with one of the major subdivisions of research in the life sciences and is under the immediate direction of individuals who perform the required interviewing and arrange for seminar leaders. These divisions include:

(1) Biochemistry, genetics, and molecular biology (general direction: Dr. C. B. Anfinsen and Dr. J. Potts). Seminars available include biochemistry, molecular biology, genetics, and biological control mechanisms. This area also utilizes certain outstanding courses in the NIH graduate program, such as theoretical organic chemistry, which are best taught by lecturing rather than through small seminar discussion groups.

(2) Neural and behavioral sciences (general direction: Dr. S. S. Kety and Dr. R. A. Cohen). Seminars include: Biological mechanism in behavior; neurochemistry; neurophysiology; neuropharmacology, functional neuroanatomy; developmental psychology and biology; psychosocial processes in behavior; cognitive processes; patterns of family interactions; cross-cultural studies.

(3) Physical biology and related exact sciences (general direction: Dr. Mones Berman and Dr. Harold Edelhoch). Seminars include: Calculus; mathematical kinetics; mathematics of regulation; probability and stochastic processes; computers and their applications in biology; radiation biology; theoretical neurophysiology, photobiology, physical chemistry, reaction kinetics; thermodynamics and statistical mechanics; amino acids, polypeptides

and proteins; nucleotides, polynucleotides, and nucleic acids, macromolecules, spectroscopy.

(4) Cell biology, physiology and immunology (general direction: Dr. C. G. Zubrod and Dr. M. Lipsett). Seminars include: Mammalian genetics; genetics and differentiation of somatic cells; behavior of cells in tissue culture; nucleotide metabolism in mammalian cells; physiology and pharmacology of biological membranes; physiology of the endocrines; reproductive physiology; cytogenetics and chromosomal aberrations; structure and function of intracellular particulates; immunochemistry.

(5) Pharmacology (a) Biochemical Pharmacology (general direction: Dr. Herbert Weissbach and Dr. Herbert Tabor). Seminar subjects include: The use of drugs in elucidating normal and abnormal physiological mechanism; chemistry and mode of action in antibiotics; drugs as inhibitors of nucleic acid synthesis. (b) Mechanism of action of drugs (general direction: Dr. Bernard B. Brodie and Dr. James R. Gillette). Seminar subjects include: Physical chemical mechanisms through which drugs cross various barriers; drug distribution in tissues; alteration of physiological and biochemical control mechanisms by drugs; kinetics of active transport; metabolic and physiological processes and radioactive traces studies.

An Associate may participate in seminars in several of the divisions during his tenure at NIH, although occasionally all needs will be met within a single division. Weekly seminars run from September through January and from February through June. Each session is of 2 to 3 hours' duration, and the participants present specific material under the direction of a qualified expert in the field. In preparation for these, the Associate does appropriate outside reading.

Combined Clinical Staff Conferences and Lectureships

Aside from the rounds and staff conferences within the separate institutes engaged in clinical research, the Clinical Center sponsors at least one monthly Combined Clinical Staff Conference for 9 months of the year. Each conference is conducted by one of the Institute services or an appropriate Department of the Clinical Center. This series of conferences is complemented by Grand Rounds and Clinical Pathological Conferences which, in effect, serve the same purpose. The conferences—open to the entire clinical staff and those engaged in laboratory research as well—center around clinical case material having interest for a large portion of the staff, and serve to keep individual investigators abreast of current emphasis in all clinical research.

Several formal lectures are presented annually. The National Institutes of Health Lecture Series was established in 1953 to recognize outstanding scientific accomplishment and to contribute to the interchange of scientific

information. The lectureships are awarded by the Director of NIH on the advice of the Scientific Directors of the Institutes. The R. E. Dyer Lectureship was established in 1950 by friends and colleagues of Dr. Rolla E. Dyer, Director of the National Institutes of Health, 1942–50, to pay him tribute upon the occasion of his retirement from the Public Health Service. The award is made at appropriate times—usually on an annual basis—to a scientist who has made an outstanding contribution to knowledge in a field of medical science; and is administered by NIH.

The Jules Freund lecture series was established in 1961 and is presented annually in honor of the first Chief of the Laboratory of Immunology, National Institute of Allergy and Infectious Diseases.

Equipment Exhibit; Symposia

The NIH Research Equipment Exhibit was established in 1951 to acquaint scientists with the most modern research tools and to give them an opportunity to discuss equipment problems with representatives of industry. In 1954, a Symposium on Recent Developments in Research Methods and Instrumentation was added, offering a balanced presentation by specialists in many areas of biomedical research. The two annual events combine to provide a convenient setting for the exchange of information between research investigators and manufacturers of scientific equipment.

The NIH International Symposium on Biomedical Research was established in 1963 to emphasize the mutuality of interest of NIH and the international scientific community, particularly with the extension of NIH programs overseas.

The Washington-Baltimore Educational Complex

The Washington-Baltimore area is widely known for its educational advantages. For example, three medical schools (Howard, Georgetown, and George Washington) are located in the District of Columbia and two (Johns Hopkins and the University of Maryland) are in Baltimore. These and the universities with which they are associated, together with unique institutions such as the Armed Forces Institute of Pathology and the Naval Medical Center, offer exceptional opportunities. Some Associates find the time to pursue a certain amount of formal education at such nearby institutions.

Library Facilities

The National Institutes of Health Library (located in the Clinical Center) provides a central facility for all scientists, technicians, administrators, and supporting staff who are engaged in the research program. As a self-service,

open-stack library, it contains a collection of 90,000 volumes and receives 4,500 serial publications, including 2,800 foreign and domestic journals. Its translation service and the proficiency of its staff in compiling bibliographies are noteworthy.

The National Library of Medicine is located on the NIH campus. While this library serves the entire country, its proximity makes it especially valuable to NIH investigators. Holdings exceed 1,100,000 items—books, journals, theses, pamphlets, prints, and microfilm. Researchers may consult material at the Library and may request printed material through the NIH inter-library loan service.

Addendum—Residencies

Fully approved residency programs are offered in clinical pathology, anatomical pathology, combined clinical and anatomical pathology, and oral pathology. Requests for information and application forms regarding these programs should be addressed to the respective program chiefs:

George Z. Williams, M.D.
Chief, Clinical Pathology Department
Clinical Center
National Institutes of Health
Bethesda, Md. 20014

Harold L. Stewart, M.D.
Chief, Pathological Anatomy
Clinical Center
National Institutes of Health
Bethesda, Md. 20014

Harold R. Stanley, D.D.S.
Chief of Oral Medicine and Surgery
National Institute of Dental Research
National Institutes of Health
Bethesda, Md. 20014

On the basis of agreements between program chiefs and appropriate American Specialty Boards, Clinical Associates in dermatology, psychiatry, and neurology may receive credit for 1, 1, and 2 years respectively. Associates in internal medicine who remain at NIH for a third year may receive credit for this year upon application to the American Board of Internal Medicine.



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